User Manual

Allen-Bradley

PowerFlex 755 Drive Embedded EtherNet/IP Adapter

Firmware Release Number 1.*xxx* (or later)

Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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This manual contains new and updated information.

New and Updated Information

This table contains the changes made to this revision.

Topic	Page
Added information about the Connected Components Workbench software tool.	Throughout manual
Removed information for PLC-5, SLC 500, and MicroLogix 1100/1400 controllers. This information is now provided in a separate document titled 'Controller Examples for EtherNet/IP Network Communications with PowerFlex 750-Series Drives', publication 750COM-AT001.	
In Chapter 1 in the subsection 'User-Supplied Equipment' under configuration tool, added Connected Components Workbench software, a free configuration tool.	14
In Chapter 4 in the 'Using Automatic Device Configuration (ADC) with RSLogix 5000 Software, Version 20.00 or Later" subsection, added new information to the introduction, along with a new Important statement and a new Tip.	59

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Glossary

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This manual provides information about the EtherNet/IP adapter embedded on the Main Control Board in PowerFlex® 755 drives, and using it for network communication.

Conventions Used in This Manual

The following conventions are used throughout this manual:

- Parameter names are shown in the format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name—for example **Parameter 01 - [DL From Net Cfg 01]**.
- The drive firmware revision number (FRN) is displayed as FRN *X.xxx*, where '*X*' is the major revision number and '*xxx*' is the minor revision number.
- The dialog box images in this manual resulted from using the following software:
  - RSLinx® Classic software, version 2.52
  - RSLogix™ 5000 software, version 16.00 (for Automatic Device Configuration information only, RSLogix 5000, version 20.00)

  Different versions of the software may have dialog boxes that vary in appearance, and differences in procedures.

Rockwell Automation Support

Rockwell Automation offers support services worldwide, with over 75 sales and support offices, over 500 authorized distributors, and over 250 authorized systems integrators located through the United States alone. In addition, Rockwell Automation representatives are in every major country in the world.

Local Product Support

Contact your local Rockwell Automation representative for the following:

- Sales and order support
- Product technical training
- Warranty support
- Support service agreements

Technical Product Assistance

For technical assistance, please review the information in Chapter 7, Troubleshooting, first. If you still have problems, then access the Allen-Bradley Technical Support website at http://www.ab.com/support/abdrives or contact Rockwell Automation.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
EtherNet/IP Media Planning and Installation Manual, ODVA publication 148 (1)	Information on the planning, installation, and techniques used to implement an EtherNet/IP network.
EtherNet/IP Network Infrastructure Guidelines, ODVA Publication 35 (1)	
Ethernet Design Considerations Reference Manual, publication ENET-RM002	
Connected Components Workbench website http://www.ab.com/support/abdrives/webupdate/software.html, and online help (2)	Information on the Connected Components Workbench™ software tool—and includes a link for **free** software download.
DriveExplorer website http://www.ab.com/drives/driveexplorer, and online help (2)	Information on using the DriveExplorer™ software tool.
DriveExecutive website http://www.ab.com/drives/drivetools, and online help (2)	Information on using the DriveExecutive™ software tool.
PowerFlex 750-Series Drive Installation Instructions, publication 750-IN001	Information on installing, programming, and technical data of PowerFlex® 750-Series Drives
PowerFlex 750-Series Drive Programming Manual, publication 750-PM001	
PowerFlex 750-Series Drive Technical Data, publication 750-TD001	
PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication 20HIM-UM001	Information on the installation and use of PowerFlex 20-HIM-A6 or 20-HIM-C6S HIMs.
Getting Results with RSLinx Guide, publication LINX-GR001, and online help (2)	Information on using RSLinx Classic software.
RSLogix 5000 PIDE Autotuner Getting Results Guide, publication PIDE-GR001, and online help (2)	Information on using the RSLogix 5000 software tool.
EtherNet/IP Modules in Logix5000 Control Systems User Manual, publication ENET-UM001	Information on using the ControlLogix® 1756-ENBT or 1756-EN2T communication modules with your Logix 5000 controller and communicating with various devices on the EtherNet/IP network.
Controller Examples for EtherNet/IP Network Communications with PowerFlex 750-Series Drives, publication 750COM-AT001	Information on using PLC-5®, SLC™ 500, and MicroLogix™ 1100/1400 controllers with PowerFlex 750-Series drives that are equipped with a 20-750-ENETR Dual-port EtherNet/IP option module or embedded EtherNet/IP adapter (PowerFlex 755 drive only).

(1) Use this link to the ODVA EtherNet/IP library: http://odva.org/Home/ODVATECHNOLOGIES/EtherNetIP/EtherNetIPLibrary/tabid/76/Default.aspx

(2) The online help is installed with the software.

You can view or download publications at http://www.rockwellautomation.com/literature. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

To find your local Rockwell Automation distributor or sales representative, visit http://www.rockwellautomation.com/locations.

For information such as firmware updates or answers to drive-related questions, go to the Drives Service & Support web site at http://www.ab.com/support/abdrives and click the Downloads or Knowledgebase link.

Getting Started

The EtherNet/IP adapter, embedded on the Main Control Board in PowerFlex 755 drives, is used for network communication.

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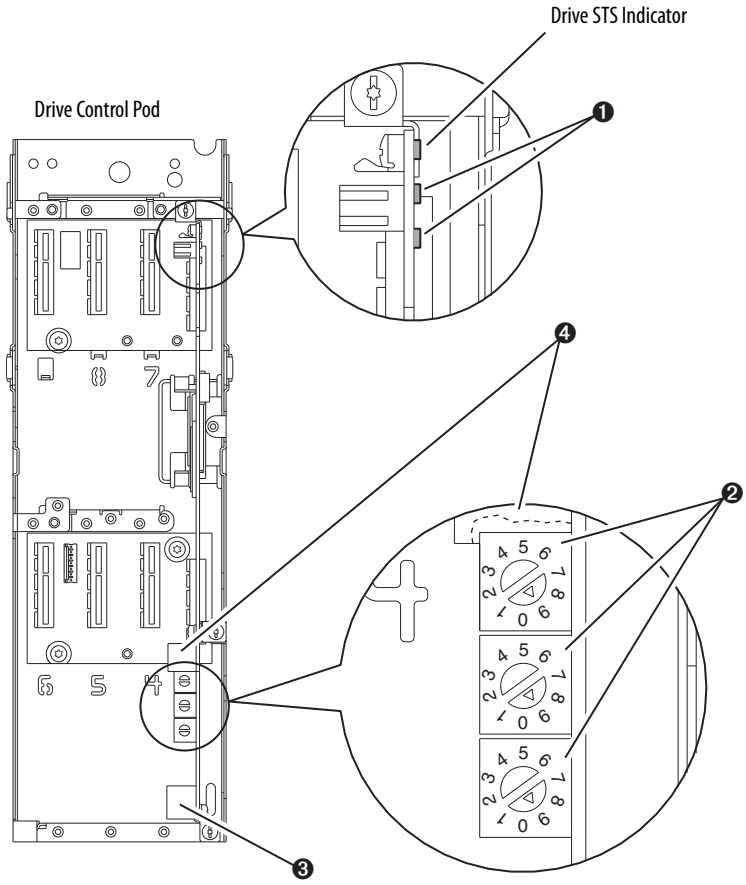
Components

Components shown with HIM bezel open and drive cover removed.



Item	Part	Description
❶	Status Indicators	Two LEDs that indicate the status of the adapter and network communication. See Chapter 7, Troubleshooting.
❷	IP Address Switches	Sets the IP address of the embedded adapter when **not** using a BOOTP server or adapter parameters. See Setting the IP Address on page 18 for details.
❸	Ethernet Connector	An RJ-45 connector for the Ethernet cable. The connector is CAT-5 compliant to ensure reliable data transfer on 100Base-TX Ethernet connections.
❹	DPI Port 2	Cable connection for handheld and remote options.

Features

The features of the embedded EtherNet/IP adapter include the following:

- Switches to set an IP address before applying power to the drive—or you can disable the switches and use a BOOTP (Bootstrap Protocol) server or adapter parameters to configure the IP address.
- Compatibility with the following configuration tools to configure the embedded EtherNet/IP adapter and host drive:
  - PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM (Human Interface Module) on the drive, if available
  - Connected Components Workbench software, version1.02 or later
  - DriveExplorer software, version 6.01 or later
  - DriveExecutive software, version 5.01 or later.
- Status indicators that report the status of the embedded EtherNet/IP adapter and network communications. They are visible when the drive cover is open or closed.
- Parameter-configured 32-bit Datalinks in the I/O to meet application requirements (16 Datalinks to write data from the network to the drive, and 16 Datalinks to read data to the network from the drive).
- Explicit Messaging support.
- Master-Slave or Peer-to-Peer hierarchy that can be configured to transmit data to and from either a controller or another PowerFlex 750-Series drive on the network.
- Supports 'Integrated Motion on the EtherNet/IP network' operation for the PowerFlex 755 drive, firmware revision 2.003 or later. For details to set up 'Integrated Motion on the EtherNet/IP network' operation, see Integrated Motion on the EtherNet/IP Network User Manual, publication MOTION-UM003.

  TIP For best reliability in 'Integrated Motion on the EtherNet/IP network' applications, we recommend that you always use Rockwell Automation Cat5e shielded Ethernet cable.

- User-defined fault actions to determine how the embedded EtherNet/IP adapter and its host PowerFlex 755 drive respond to the following:
  - I/O messaging communication disruptions (Comm Flt Action)
  - Controllers in Idle mode (Idle Flt Action)
  - Peer device communication disruptions (Peer Flt Action)
  - Explicit messaging disruptions for drive control via PCCC, the CIP Register Object or the CIP Assembly Object (Msg Flt Action)

- Automatic Device Configuration (ADC), which is an 'RSLogix 5000 software, version 20.00, feature' that supports the automatic download of configuration data. This occurs after the Logix controller establishes an EtherNet/IP network connection to a PowerFlex 755 drive (firmware revision 4.001 or later) and its associated peripherals.
- Web pages, viewed by using a web browser, that show information about the embedded EtherNet/IP adapter, its host drive, and DPI devices connected to the drive.
- Configured e-mail messaging to desired addresses when selected drive faults occur and/or are cleared, and/or when the embedded EtherNet/IP adapter takes a communication or idle fault action.
- Access to any PowerFlex drive and its connected peripherals on the network to which the embedded EtherNet/IP adapter is connected.

Compatible Products

At the time of publication, the embedded EtherNet/IP adapter is compatible with Allen-Bradley PowerFlex 755 drives.

Required Equipment

Some of the equipment that is required for use with the embedded EtherNet/IP adapter is shipped with the drive, but some you must supply yourself.

Equipment Shipped with the Drive

Since the EtherNet/IP adapter is embedded on the Main Control Board in the PowerFlex 755 drive, it is always an integral part of the drive and, therefore, does not require installation instructions.

User-Supplied Equipment

To configure the embedded EtherNet/IP adapter, you must supply the following:

- ❑ A small screwdriver
- ❑ Ethernet cable (for details, see the EtherNet/IP Media Planning and Installation Manual, ODVA publication 148 available on the ODVA website at http://odva.org/Home/ODVATECHNOLOGIES/EtherNetIP/EtherNetIPLibrary/tabid/76/Default.aspx)
- ❑ Ethernet switch (for details, see the Ethernet Design Considerations Reference Manual, publication ENET-RM002)

- ❑ Drive and embedded adapter configuration tool, such as the following:
  - PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM
  - Connected Components Workbench software, version 1.02 or later

    Connected Components Workbench is the recommended stand-alone software tool for use with PowerFlex drives. You can obtain a **free copy** by:
    - Internet download at http://www.ab.com/support/abdrives/webupdate/software.html
    - Requesting a DVD at http://www.ab.com/onecontact/controllers/micro800/

    Your local distributor may also have copies of the DVD available.

    Connected Components Workbench software cannot be used to configure SCANport-based drives or Bulletin 160 drives.
  - DriveExplorer software, version 6.01 or later

    This software tool has been discontinued and is now available as **freeware** at http://www.ab.com/support/abdrives/webupdate/software.html. There are no plans to provide future updates to this tool and the download is being provided 'as-is' for users that lost their DriveExplorer CD, or need to configure legacy products not supported by Connected Components Workbench software.
  - DriveExecutive software, version 5.01 or later

    A Lite version of DriveExecutive software ships with RSLogix 5000, RSNetWorx MD, FactoryTalk AssetCentre, and ItelliCENTER software. All other versions are purchasable items:
    - 9303-4DTE01ENE Drive Executive software
    - 9303-4DTS01ENE DriveTools SP Suite (includes DriveExecutive and DriveObserver software)
    - 9303-4DTE2S01ENE DriveExecutive software upgrade to DriveTools SP Suite (adds DriveObserver software)

    DriveExecutive software updates (patches, and so forth) can be obtained at http://www.ab.com/support/abdrives/webupdate/software.html. It is highly recommended that you periodically check for and install the latest update.
  - BOOTP, version 2.1 or later, for network setup only
- ❑ Controller configuration software, such as RSLogix 5000 software, version 20.00 and earlier, or Studio 5000™ Logix Designer application, version 21.00 and later
- ❑ A computer connection to the EtherNet/IP network

Safety Precautions

Please read the following safety precautions carefully.

ATTENTION: Risk of injury or equipment damage exists. Only personnel familiar with drive and power products and the associated machinery should plan or implement the installation, start up, configuration, and subsequent maintenance of the drive using this embedded adapter. Failure to comply may result in injury and/or equipment damage.

ATTENTION: Risk of equipment damage exists. The embedded adapter contains electrostatic discharge (ESD) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the adapter. If you are unfamiliar with static control procedures, see Guarding Against Electrostatic Damage, publication 8000-4.5.2.

ATTENTION: Risk of injury or equipment damage exists. If the adapter is transmitting control I/O to the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting the adapter.

ATTENTION: Risk of injury or equipment damage exists. Embedded adapter **Parameters 54 - [Comm Flt Action]**, **55 - [Idle Flt Action]**, **56 - [Peer Flt Action]**, and **57 - [Msg Flt Action]** let you determine the action of the adapter and drive if I/O communication is disrupted, the controller is idle, peer I/O is disrupted, or explicit messaging for drive control is disrupted. By default, these parameters fault the drive. You may configure these parameters so that the drive continues to run, however, precautions should be taken to verify that the settings of these parameters do not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable or a controller in idle state).

ATTENTION: Risk of injury or equipment damage exists. When a system is configured for the first time, there may be unintended or incorrect machine motion. Disconnect the motor from the machine or process during initial system testing.

ATTENTION: Risk of injury or equipment damage exists. The examples in this publication are intended solely for purposes of example. There are many variables and requirements with any application. Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication.

Quick Start

This section is provided to help experienced users quickly start using the embedded EtherNet/IP adapter. If you are unsure how to complete a step, refer to the referenced chapter.

Step	Action	See
1	Review the safety precautions for the adapter.	Throughout this manual
2	Verify that the PowerFlex drive is properly installed.	PowerFlex 750-Series AC Drive Installation Instructions, publication 750-IN001
3	Set the adapter IP address. a. When using the adapter switches, set the IP address now and proceed with step 4. When using a BOOTP server, or adapter parameters instead to set the IP address, first perform step 3b and 3c, and all of step 4. Then proceed with step 5. b. Verify that the PowerFlex drive is not powered. c. Connect the embedded EtherNet/IP adapter to the network with an Ethernet cable.	Chapter 2, Installing the Adapter
4	Apply power to the drive. a. Replace the drive cover or close the drive door. b. Apply power to the drive. The embedded EtherNet/IP adapter receives power from the drive. The status indicators should be green. If they flash red, there is a problem. See Chapter 7, Troubleshooting. c. Configure and verify key drive parameters.	Chapter 2, Installing the Adapter
5	Configure the adapter for your application. Set embedded EtherNet/IP adapter parameters for the following functions as required by your application: • IP address, subnet mask, and gateway address (only when not using adapter switches) • Data rate • I/O configuration • Master-Slave or Peer-to-Peer hierarchy • Fault actions • Web enable and features	Chapter 3, Configuring the Adapter
6	Configure the controller to communicate with the adapter. Use a controller configuration tool, such as RSLogix software, to configure the master on the network to recognize the embedded EtherNet/IP adapter and drive.	Chapter 4, Configuring the I/O
7	Create a ladder logic program. Use a controller configuration tool, such as RSLogix software, to create a ladder logic program that enables you to do the following: • Control the drive, via the embedded EtherNet/IP adapter, by using I/O. • Monitor or configure the drive by using explicit messages.	Chapter 5, Using the I/O Chapter 6, Using Explicit Messaging

Installing the Adapter

Since the EtherNet/IP adapter is embedded on the Main Control Board in the PowerFlex 755 drive, the only required adapter installation is setting its IP address and connecting it to the network.

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Preparing for an Installation

Before installing the embedded EtherNet/IP adapter, do the following:

- Make sure the Ethernet switch is the correct type. A 'managed' switch that supports IGMP snooping is usually recommended. An 'unmanaged' switch can be used instead if RSLogix 5000 software, version 18.00 or later, is used and all devices on the network are configured for 'unicast' I/O. For more details, see the following documents:
  - EtherNet/IP Media Planning and Installation Manual, ODVA publication 148
  - EtherNet/IP Network Infrastructure Guidelines, ODVA publication 35
  - Ethernet Design Considerations Reference Manual, publication ENET-RM002
- Understand IGMP Snooping/Ethernet Switches

  The embedded EtherNet/IP adapter is a multicast device. In most situations, an IGMP snooping (managed) switch is required. If more than one or two embedded EtherNet/IP adapters are connected to the switch, a managed switch is required—otherwise the drive may fault on a Net IO Timeout network loss. The embedded EtherNet/IP adapter, RSLogix 5000 software version 18 or later, and a ControlLogix or CompactLogix controller will support unicast. Unicast setup is required when adding the drive to the I/O. When all embedded EtherNet/IP adapters are set up as unicast devices, then an IGMP snooping (managed) switch is not needed.

  Much of EtherNet/IP implicit (I/O) messaging uses IP multicast to distribute I/O control data, which is consistent with the CIP producer/

consumer model. Historically, most switches have treated multicast packets the same as broadcast packets. That is, all multicast packets are re-transmitted to all ports.

IGMP snooping constrains the flooding of multicast traffic by dynamically configuring switch ports so that multicast traffic is forwarded only to ports associated with a particular IP multicast group.

Switches that support IGMP snooping (managed switches) 'learn' which ports have devices that are part of a particular multicast group and only forward the multicast packets to the ports that are part of the multicast group.

Be careful as to what level of support a switch has of IGMP snooping. Some layer 2 switches that support IGMP snooping require a router (which could be a layer 3 switch) to send out IGMP polls to learn what devices are part of the multicast group. Some layer 2 switches can use IGMP snooping without a router sending polls. If your control system is a standalone network or is required to continue performing if the router is out of service, make sure the switch you are using supports IGMP snooping without a router being present.

- See Appendix A for the number of CIP connections supported by the embedded EtherNet/IP adapter.
- Verify that you have all required equipment. See Required Equipment on page 13.

Setting the IP Address

There are several ways to configure the embedded EtherNet/IP adapter IP address:

- **Adapter Rotary Switches** — Use the switches when working on a simple, isolated network (for example, 192.168.1.xxx) that has other products with switches to set their IP addresses, does not need to be accessed from outside the network, and you prefer a simplified node addressing method. The three adapter switches are read when the drive powers up, and represent three decimal digits from top to bottom. If set to a valid address (001...254), the adapter will use that value as the lower octet of its IP address (192.168.1.xxx, where xxx = rotary switch settings), along with a subnet mask of 255.255.255.0 and there will be no gateway configured. Also, the setting for adapter **Parameter 36 - [BOOTP]** is automatically ignored.

  See Figure 1 on page 19 and its accompanying table for switch settings and their related descriptions.

IMPORTANT	When using the adapter rotary switches, set the IP address before power is applied because the adapter uses the IP address it detects when it first receives power.

- **Adapter Parameters** — Use adapter parameters when you want more flexibility in setting up the IP address, or need to communicate outside the control network using a gateway. To use parameters as the source for the IP address, the rotary switches must be set to a value other than 001...254 or 888, and **Parameter 36 - [BOOTP]** must be set to '0' (disabled). The IP address, subnet mask, and gateway addresses will then come from the values set using the associated adapter parameters.

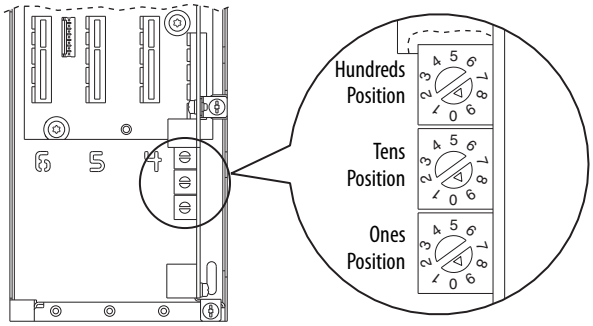
- **BOOTP** — Use BOOTP, the default, when you want to configure a **temporary** IP addresses, subnet mask, and gateway address for the adapter using a BOOTP server. To use BOOTP as the source for the IP address, the rotary switches must be set to a value other than 001...254 or 888, and **Parameter 36 - [BOOTP]** must be set to '1' (enabled).

  Note the adapter's hardware Ethernet Address (MAC) on the drive's Main Control Board, which will be used in step 6 when configuring the BOOTP server (see Using a BOOTP Server on page 26 for details).

TIP If the PowerFlex 755 drive is connected to a Stratix 6000 or Stratix 8000 managed Ethernet switch and the drive is set for BOOTP mode, the 'dynamic IP address assignment by port' (Stratix 6000) or 'DHCP persistence' (Stratix 8000) feature will set the IP address for the drive. For more details, see the Stratix 6000 Ethernet Managed Switch User Manual, publication 1783-UM001 or the Stratix 8000 and Stratix 8300 Ethernet Managed Switches User Manual, publication 1783-UM003.

IMPORTANT Regardless of the method used to set the adapter IP address, each node on the EtherNet/IP network must have a unique IP address. To change an IP address, you must set the new value and then remove and reapply power to (or reset) the adapter.

Figure 1 - Setting the IP Address Switches



Settings	Description
001…254	The adapter will use the rotary switch settings for the IP address (192.168.1.xxx, where xxx = rotary switch settings). The value stored in **Parameter 36 - [BOOTP]** is automatically ignored.
888	Resets the adapter IP address function to factory defaults. Thereafter, the drive must be powered down, the switches set to a correct value (001…254), and then the drive must be powered up again to accept the new address.
Any other setting	Disables the rotary switches and requires using **Parameter 36 - [BOOTP]** to select the BOOTP server as the source for the IP address or, if disabled, selects the adapter parameters as the source.

The switch settings can be verified by viewing Diagnostic Device Item number 68 (page 111) with any of the following drive configuration tools:

- PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM
- Connected Components Workbench software, version 1.02 or later
- DriveExplorer software, version 6.01 or later
- DriveExecutive software, version 5.01 or later

Also, you can use **Parameter 37 - [Net Addr Src]**, a read-only parameter, to verify the selected setting for **Parameter 36 - [BOOTP]**.

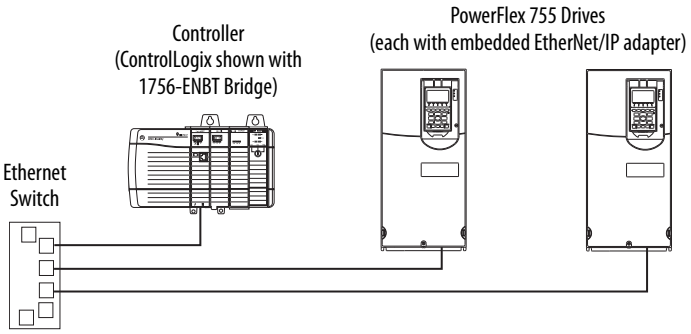
Connecting the Adapter to the Network

ATTENTION: Risk of injury or death exists. The PowerFlex drive may contain high voltages that can cause injury or death. Remove power from the drive, and then verify power has been discharged before connecting the embedded EtherNet/IP adapter to the network.

1. Remove power from the drive.
2. Remove the drive cover and lift up the drive HIM bezel to its open position to access the drive control pod.
3. Use static control precautions.
4. Connect one end of an Ethernet cable to the network.

   See Figure 2 for an example of wiring to an EtherNet/IP network.

   Figure 2 - Connecting the Ethernet Cable to the Network



5. Route the other end of the Ethernet cable through the bottom of the PowerFlex 755 drive, and insert the cable plug into the embedded EtherNet/IP adapter mating socket (item 3 in Components on page 11).

Applying Power

ATTENTION: Risk of equipment damage, injury, or death exists. Unpredictable operation may occur if you fail to verify that parameter settings are compatible with your application. Verify that settings are compatible with your application before applying power to the drive.

Install the drive cover, and apply power to the drive. The embedded EtherNet/IP adapter receives its power from the drive. When you apply power to the embedded EtherNet/IP adapter for the first time, its ENET status indicator should be steady green or flashing green after an initialization. If it is red, there is a problem. See Chapter 7, Troubleshooting.

Start-Up Status Indications

After power has been applied, the drive STS (status) indicator and the embedded EtherNet/IP adapter ENET and LINK status indicators can be viewed on the front of the drive (Figure 3). Possible start-up status indications are shown in Table 1.

Figure 3 - Drive and Adapter Status Indicators

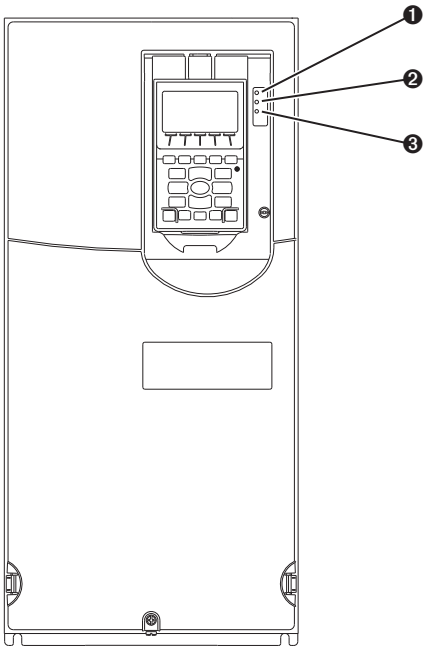


Table 1 - Drive and Adapter Start-Up Status Indications

Item	Name	Color	State	Description
Drive STS Indicator				
❶	STS (Status)	Green	Flashing	Drive ready but not running, and no faults are present.
			Steady	Drive running, no faults are present.
		Yellow	Flashing	When running, a type 2 (non-configurable) alarm condition exists – drive continues to run. When stopped, a start inhibit condition exists and the drive cannot be started (see drive parameter 933 - [Start Inhibit]).
			Steady	A type 1 (user configurable) alarm condition exists, but the drive continues to run.
		Red	Flashing	A major fault has occurred. Drive will stop. Drive cannot be started until fault condition is cleared.
			Steady	A non-resettable fault has occurred.
		Red/Yellow	Flashing Alternately	A minor fault has occurred. Use drive parameter 950 - [Minor Flt Config] to enable. If not enabled, acts like a major fault. When running, the drive continues to run. System is brought to a stop under system control. The fault must be cleared to continue.
		Yellow/Green	Flashing Alternately	When running, a type 1 alarm exists.
		Green/Red	Flashing Alternately	Drive is firmware updating.
Embedded EtherNet/IP Adapter Status Indicators				
❷	ENET	Unlit	Off	Adapter and/or network is not powered, adapter is not properly connected to the network, or adapter needs an IP address.
		Red	Flashing	An EtherNet/IP connection has timed out.
			Steady	Adapter failed the duplicate IP address detection test.
		Red/Green	Flashing Alternately	Adapter is performing a self-test.
		Green	Flashing	Adapter is properly connected, but is not communicating with any devices on the network.
			Steady	Adapter is properly connected and communicating on the network.
❸	LINK	Unlit	Off	Adapter is not powered or is not transmitting on the network.
		Green	Flashing	Adapter is properly connected and transmitting data packets on the network.
			Steady	Adapter is properly connected, but is not transmitting on the network.

After verifying correct operation, swing down the drive HIM bezel to its closed position and install the drive cover. For more details on status indicator operation, see page 108.

Configuring and Verifying Key Drive Parameters

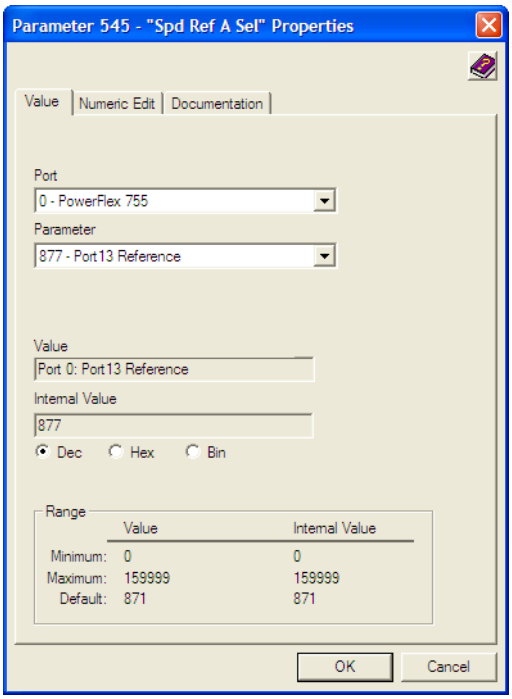
The PowerFlex 755 drive can be separately configured for the control and Reference functions in various combinations. For example, you could set the drive to have its control come from a peripheral or terminal block with the Reference coming from the network. Or you could set the drive to have its control come from the network with the Reference coming from another peripheral or terminal block. Or you could set the drive to have both its control and Reference come from the network.

The following steps in this section assume that the drive will receive the Logic Command and Reference from the network.

1. Verify that drive Parameter 301 - [Access Level] is set to ‘1’ (Advanced) or ‘2’ (Expert) to access the required parameters in this procedure.

2. Use drive Parameter 545 - [Speed Ref A Sel] to set the drive speed Reference.

   a. Set the Port field to '0 - PowerFlex 755' as shown below.



   b. Set the Parameter field to point to the port in which the embedded EtherNet/IP adapter is located (always 'Port 13 Reference' – the drive port dedicated to the embedded EtherNet/IP adapter).

      The number '877' in the Parameter field of the example dialog box above is the parameter in the drive that points to the port.

3. Verify that drive Parameter 930 - [Speed Ref Source] is reporting that the source of the Reference to the drive (Port 0) is the port in which the embedded EtherNet/IP adapter resides (always 'Port 13 Reference').

   This ensures that any Reference commanded from the network can be monitored by using drive Parameter 002 - [Commanded SpdRef]. If a problem occurs, this verification step provides the diagnostic capability to determine whether the drive/embedded adapter or the network is the cause.

4. If hard-wired discrete digital inputs are not used to control the drive, verify that all unused digital input drive parameters are set to '0' (Not Used).

Commissioning the Adapter

To commission the embedded EtherNet/IP adapter, you must set a unique IP address. See the Glossary for details about IP addresses. When using the adapter switches, see Setting the IP Address on page 18 for details. When not using these switches, a BOOTP server or adapter parameters can be used to set the IP address after connecting the adapter to the network and applying power to the drive.

By default, the adapter is configured so that you must set the IP address using a BOOTP server. For details, see Using a BOOTP Server on page 26. To set the IP address using adapter parameters, see Using Adapter Parameters on page 30.

IMPORTANT New settings for some adapter parameters (for example, **Parameters 38 - [IP Addr Cfg 1]** through **41 - [IP Addr Cfg 4]**) are recognized only when power is applied to the adapter or it is reset. After you change parameter settings, cycle power or reset the adapter.

Configuring the Adapter

This chapter provides instructions and information for setting the parameters to configure the embedded EtherNet/IP adapter.

Topic	Page
Configuration Tools	25
Using the PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM to Access Parameters	26
Setting the Adapter IP Address	26
Setting the Data Rate	31
Selecting Master-Slave or Peer-to-Peer Hierarchy	32
Setting a Fault Action	38
Setting Web Access Control	40
Resetting the Adapter	41
Restoring Adapter Parameters to Factory Defaults	41
Viewing the Adapter Status Using Parameters	42
Updating the Adapter Firmware	43

For a list of parameters, see Appendix B, Adapter Parameters. For definitions of terms in this chapter, see the Glossary.

Configuration Tools

The embedded EtherNet/IP adapter stores parameters and other information in its own nonvolatile storage (NVS) memory. You must, therefore, access the adapter to view and edit its parameters. The following tools can be used to access the adapter parameters.

Tool	See
PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM	page 26
BOOTP server	page 26
Connected Components Workbench software, version 1.02 or later	http://www.ab.com/support/abdrives/webupdate/software.html, or online help (installed with the software)
DriveExplorer software, version 6.01 or later	http://www.ab.com/drives/driveexplorer, or online help (installed with the software)
DriveExecutive software, version 5.01 or later	http://www.ab.com/drives/drivetools, or online help (installed with the software)

Using the PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM to Access Parameters

If your drive has an enhanced PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM, it can be used to access parameters in the adapter.

1. Display the Status screen, which is shown on HIM powerup.
2. Use the 4 or 6 key to scroll to the Port in which the embedded EtherNet/IP adapter resides (always Port 13).
3. Press the PAR# *soft key* to display the Jump to Param # entry pop-up box.
4. Use the numeric keys to enter the desired parameter number, or use the ▲ or ▼ *soft key* to scroll to the desired parameter number.

For details on viewing and editing parameters, see the PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication 20HIM-UM001.

Setting the Adapter IP Address

When the adapter IP Address switches (Figure 1 on page 19) are set to a value other than 001...254 or 888, **Parameter 36 - [BOOTP]** determines the source for the adapter node address. By default, the embedded EtherNet/IP adapter is configured to set its IP address, subnet mask, and gateway address by using a BOOTP server. To use a BOOTP server to set the node address, see the procedure in Using a BOOTP Server. To use adapter parameters, see Using Adapter Parameters on page 30.

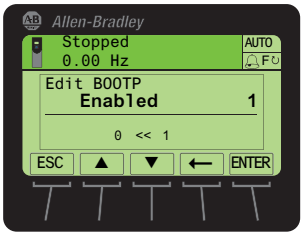
Using a BOOTP Server

TIP If the PowerFlex 755 drive is connected to a Stratix 6000 or Stratix 8000 managed Ethernet switch and the drive is set for BOOTP mode, the 'dynamic IP address assignment by port' (Stratix 6000) or 'DHCP persistence' (Stratix 8000) feature will set the IP address for the drive. For more details, see the Stratix 6000 Ethernet Managed Switch User Manual, publication 1783-UM001, or the Stratix 8000 and Stratix 8300 Ethernet Managed Switches User Manual, publication 1783-UM003.

There is a variety of BOOTP servers available. The following instructions use Rockwell Automation's BOOTP/DHCP Server, version 2.3 or later, a **free** standalone program that incorporates the functionality of standard BOOTP and DHCP utilities with a graphical interface. It is available from http://www.software.rockwell.com/support/download/detail.cfm?ID=3390. See the Readme file and online Help for directions and more information.

TIP If you prefer to configure the IP address, subnet mask, and gateway address using adapter parameters, set adapter **Parameter 36 - [BOOTP]** to '0' (disabled). For details, see Using Adapter Parameters on page 30.

1. Verify that **Parameter 36 - [BOOTP]** is set to '1' (Enabled).



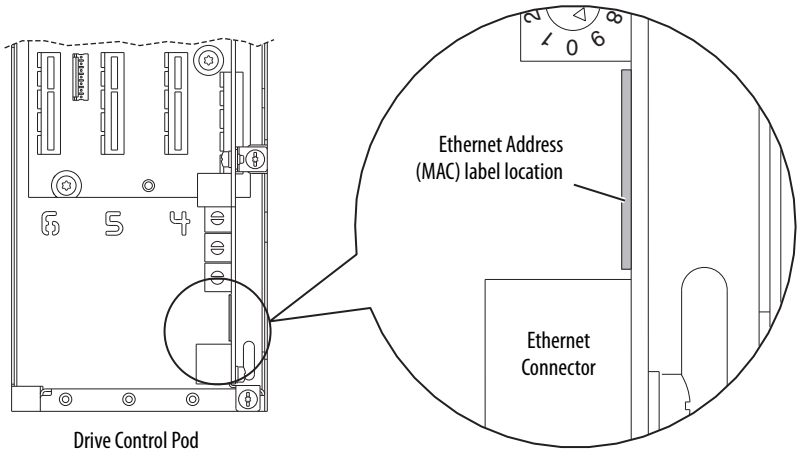
Value	Setting
0	Disabled
1	Enabled (Default)

2. Note the adapter's hardware Ethernet Address (MAC), which will be used in step 7.

   There are two ways to do this:

   - Remove the PowerFlex 755 drive cover and locate the adapter's hardware Ethernet Address (MAC) label on the drive's Main Control Board (Figure 4).

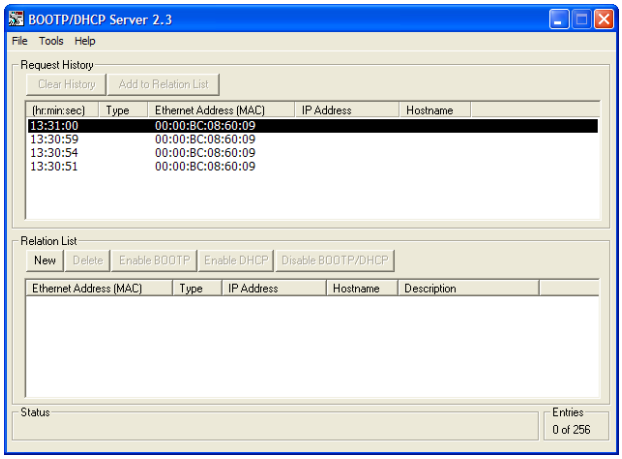
Figure 4 - Adapter Hardware Address Label Location



   - Use the HIM to scroll to drive Port 13 and access the embedded EtherNet/IP adapter DIAGNOSTIC folder screen. Then scroll to Diagnostic Items 43...48 (HW Addr 1...6) to view the adapter's hardware Ethernet Address (MAC). Finally, convert these decimal values to a hex value.

3. On a computer connected to the EtherNet/IP network, start the BOOTP/DHCP software.

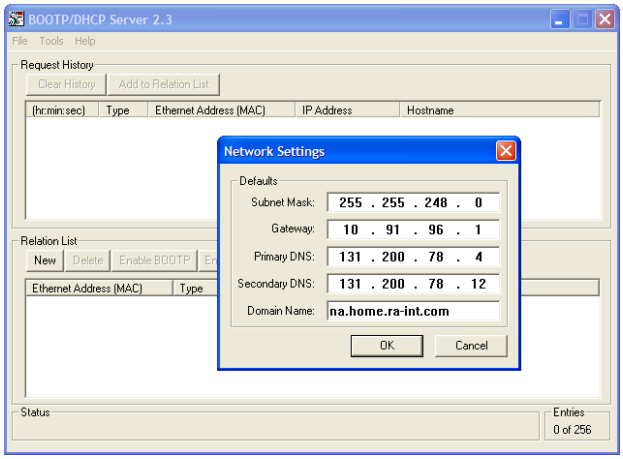
   The BOOTP/DHCP Server dialog box appears.



To properly configure devices on your EtherNet/IP network, you must configure settings in the BOOTP/DHCP software to match the network.

4. From the Tools menu, choose Network Settings.

   The Network Settings dialog box opens.



5. Edit the following:

Box	Type
Subnet Mask (1)	The subnet mask for the embedded EtherNet/IP adapter's network.
Gateway (1)	The IP address of the gateway device on the adapter's network.
Primary DNS	The address of the primary DNS server to be used on the local end of the link for negotiating with remote devices.
Secondary DNS	Optional—the address of the secondary DNS server to be used on the local end of the link for negotiating with remote devices when the primary DNS server is unavailable.
Domain Name	The text name corresponding to the numeric IP address that was assigned to the server that controls the network.

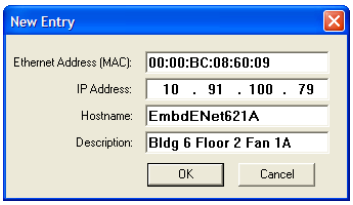
(1) For definitions of these terms, see the Glossary.

6. Click OK to apply the settings.

   Devices on the network issuing BOOTP/DHCP requests appear in the BOOTP/DHCP Request History list.

7. In the BOOTP/DHCP Request History list, either double-click the adapter's Ethernet Address (MAC) noted in step 2, or click New in the Relation List.

   The New Entry dialog box appears. In the first instance, the Ethernet Address (MAC) is automatically entered. In the latter instance, it must be manually entered.



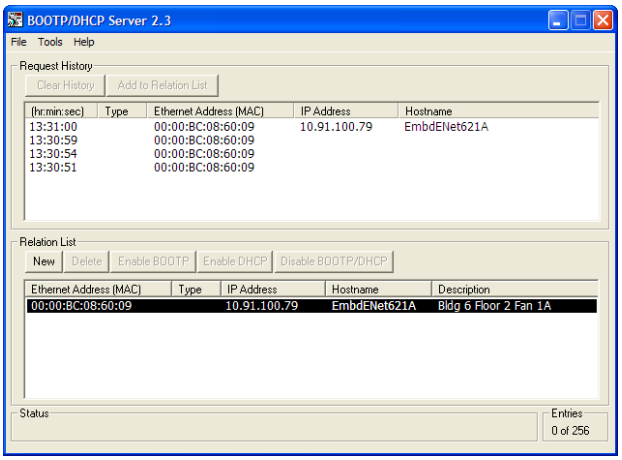
8. Edit the following:

Box	Type
IP Address (1)	A unique IP address for the adapter
Host Name	Optional
Description	Optional

(1) For definition of this term, see the Glossary.

9. Click OK to apply the settings.

   The adapter appears in the Relation List with the new settings.



10. To permanently assign this configuration to the adapter, select the device in the Relation List and click Disable BOOTP/DHCP.

    When power is cycled on the adapter, it will use the configuration you assigned it and not issue new BOOTP requests.

    TIP To enable BOOTP for an embedded adapter that has had BOOTP disabled, first select the adapter in the Relation List. Then click Enable BOOTP and, lastly, reset the adapter or power cycle the drive.

11. From the File menu, choose Save to save the Relation List.

Using Adapter Parameters

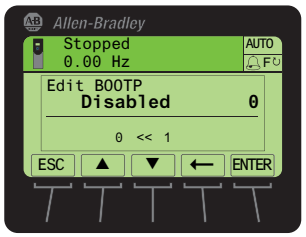
By default, the adapter is configured to use a BOOTP server as the source for the adapter IP address, subnet mask, and gateway address. To use adapter parameters instead, you must first disable BOOTP with **Parameter 36 - [BOOTP]**. Then set the associated adapter parameters as described in the following subsections.

Disable the BOOTP Feature

1. Verify that the IP Address switches (Figure 1 on page 19) are set to any value other than 001...254 or 888.

   The default setting is 999.

2. Set the value of **Parameter 36 - [BOOTP]** to '0' (Disabled).

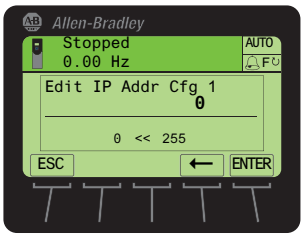


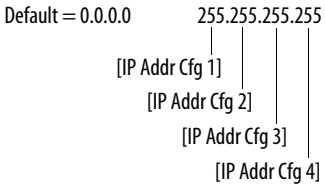
Value	Setting
0	Disabled
1	Enabled (Default)

3. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.
4. Perform the steps in the following subsections to set the IP address, subnet mask, and gateway address using adapter parameters.

Set the IP Address

1. Verify that **Parameter 36 - [BOOTP]** is set to '0' (Disabled).
2. Set the value of **Parameters 38 - [IP Addr Cfg 1]** through **41 - [IP Addr Cfg 4]** to a unique IP address.





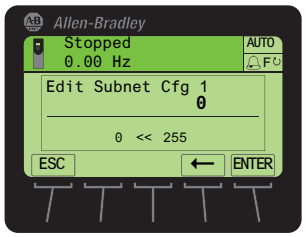
3. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.

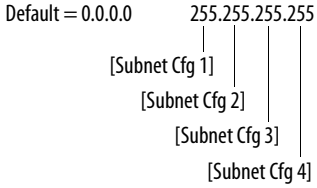
   The ENET status indicator will be steady green or flashing green if the IP address is correctly configured.

Set the Subnet Mask

1. Verify that **Parameter 36 - [BOOTP]** is set to '0' (Disabled).

2. Set the value of **Parameters 42 - [Subnet Cfg 1]** through **45 - [Subnet Cfg 4]** to the desired value for the subnet mask.

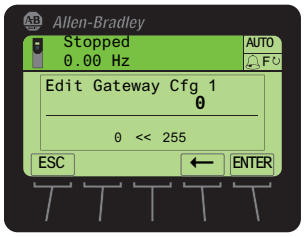


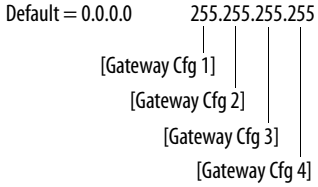


3. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.

Set the Gateway Address

1. Verify that **Parameter 36 - [BOOTP]** is set to '0' (Disabled).
2. Set the value of **Parameters 46 - [Gateway Cfg 1]** through **49 - [Gateway Cfg 4]** to the IP address of the gateway device.



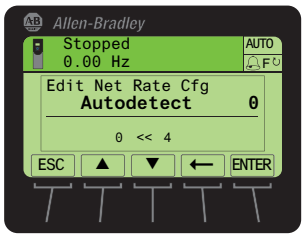


3. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.

Setting the Data Rate

By default, the adapter is set to autodetect, so it automatically detects the data rate and duplex setting used on the network. If you need to set a specific data rate and duplex setting, the value of **Parameter 50 - [Net Rate Cfg]** determines the Ethernet data rate and duplex setting that the adapter will use to communicate. For definitions of data rate and duplex, see the Glossary.

1. Set the value of **Parameter 50 - [Net Rate Cfg]** to the data rate at which your network is operating.



Value	Data Rate
0	Autodetect (default)
1	10 Mbps Full
2	10 Mbps Half
3	100 Mbps Full
4	100 Mbps Half

TIP Auto detection of baud rate and duplex works properly only if the device (usually a switch) on the other end of the cable is also set to automatically detect the baud rate/duplex. If one device has the baud rate/duplex hard-coded, the other device must be hard-coded to the same settings.

2. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.

Selecting Master-Slave or Peer-to-Peer Hierarchy

This procedure is only required if Datalinks are used to write or read data of the drive or its connected peripherals. A hierarchy determines the type of device with which the adapter exchanges data. In a Master-Slave hierarchy, the adapter exchanges data with a master, such as a scanner or bridge. In a Peer-to-Peer hierarchy, the adapter exchanges data with embedded EtherNet/IP adapters in other PowerFlex 755 drives.

For both Master-Slave and Peer-to-Peer hierarchies, the devices exchanging data must be on the same IP subnet. See 'IP Addresses' in the Glossary for information about IP subnets.

Setting a Master-Slave Hierarchy

Enable Datalinks To Write Data

The controller output image (controller outputs-to-drive) can have 0 to 16 additional 32-bit parameters (Datalinks). They are configured using **Parameters 01 - [DL From Net 01]** through **16 - [DL From Net 16]**. The number of Datalinks actively used is controlled by the connection size in the controller. See the respective controller example sections in Chapter 4 for more information on setting the connection size.

IMPORTANT Always use the Datalink parameters in consecutive numerical order, starting with the first parameter. For example, use Parameters 01, 02, and 03 to configure three Datalinks to write data. Otherwise, the network I/O connection will be larger than necessary, which needlessly increases controller response time and memory usage.

TIP When using a ControlLogix controller and an RSLogix 5000 drive Add-on Profile, version 16.00 or later, there is no need to configure Datalink parameters at this time. They will be assigned when configuring the RSLogix 5000 drive Add-on Profile (see Add the Drive/Adapter to the I/O Configuration on page 50).

When using a ControlLogix controller and the Generic Profile, configure the Datalink parameters now as described in this section.

Parameters 01 - [DL From Net 01] through **16 - [DL From Net 16]** control which parameters in the drive, embedded adapter, or any other connected

peripheral receive the values from the network. You can use the PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM, or another drive configuration tool such as Connected Components Workbench, DriveExplorer, or DriveExecutive software to select the drive or peripheral by port number and the parameter by name. As an alternate method, the parameter value can be set manually by number using this formula:

From Net Parameter Value = (10000 * Port Number) + (Destination Parameter Number)

For example, suppose you want to use **Parameter 01 - [DL From Net 01]** to write to Parameter 03 of an optional encoder card plugged into drive Port 5. Using the formula, the value for **Parameter 01 - [DL From Net 01]** would be (10000 * 5) + (3) = 50003.

Follow these steps to enable Datalinks to write data.

1. Set the values of only the required number of contiguous controller-to-drive Datalinks needed to write data to the drive and that are to be included in the network I/O connection.
2. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.
3. Since the Logic Command and Reference are always used in the adapter, configure the parameters in the drive to accept the Logic Command and Reference from the adapter.

   When using the controller for speed reference via the adapter, set two fields in drive Parameter 545 - [Speed Ref A Sel].

   a. Set the Port field for the drive (for example, 0 - PowerFlex 755).
   b. Set the Parameter field to point to the drive port in which the embedded EtherNet/IP adapter is installed (always 'Port 13 Reference', the drive port dedicated to the embedded adapter).

      Also, verify that the mask parameters in the drive (for example, Parameter 324 - [Logic Mask]) are configured to receive the desired logic from the adapter. See the drive documentation for details.

After the above steps are complete, the adapter is ready to receive input data and transfer status data to the master (controller). Next, configure the controller to recognize and transmit I/O to the adapter. See Chapter 4, Configuring the I/O.

Enable Datalinks To Read Data

The controller input image (drive-to-controller inputs) can have 0 to 16 additional 32-bit parameters (Datalinks). They are configured using **Parameters 17 - [DL To Net 01]** through **32 - [DL To Net 16]**. The number of Datalinks actively used is controlled by the connection size in the controller. See the

respective controller example sections in Chapter 4 for more information on setting the connection size.

IMPORTANT	Always use the Datalink parameters in consecutive numerical order, starting with the first parameter. For example, use Parameters 17, 18, 19, 20, and 21 to configure five Datalinks to read data. Otherwise, the network I/O connection will be larger than necessary, which needlessly increases controller response time and memory usage.

TIP	When using a ControlLogix controller and an RSLogix 5000 drive Add-on Profile, version 16.00 or later, there is no need to configure Datalink parameters at this time. They will be assigned when configuring the RSLogix 5000 drive Add-on Profile (see Add the Drive/Adapter to the I/O Configuration on page 50).

When using a ControlLogix controller and the Generic Profile, configure the Datalink parameters now as described in this section.

Parameters 17 - [DL To Net 01] through **32 - [DL To Net 16]** configure which parameters in the drive, adapter, or any other connected peripheral send the values to the network. You can use the PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM, or another drive configuration tool such as Connected Components Workbench, DriveExplorer, or DriveExecutive software to select the drive or peripheral by port number and the parameter by name. As an alternate method, the parameter value can be set manually by number using this formula:

To Net Parameter Value = (10000 * Port Number) + (Origination Parameter Number)

For example, suppose you want to use **Parameter 17 - [DL To Net 01]** to read Parameter 2 of an optional I/O card plugged into drive Port 6. Using the formula, the value for **Parameter 17 - [DL To Net 01]** would be (10000 * 6) + (2) = 60002.

Follow these steps to enable Datalinks to read data.

1. Set the values of only the required number of contiguous drive-to-controller Datalinks needed to read data from the drive and that are to be included in the network I/O connection.
2. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.

The adapter is configured to send output data to the master (controller). You must now configure the controller to recognize and transmit I/O to the adapter. See Chapter 4, Configuring the I/O.

Setting the Adapter to Transmit Peer-to-Peer Data

Peer-to-peer communication can be set up as a simple peer I/O configuration or a custom peer I/O configuration.

Simple Peer I/O Configuration

The most common use of peer I/O is to take the Logic Command and Reference from one drive and repeat it over Ethernet to one or more other drives. If scaling of the Reference is needed to enable drives to run at different but related speeds, use drive Parameter 609 - [TrmPct RefA Stpt]. The embedded EtherNet/IP adapter provides a simplified configuration method for simple peer I/O.

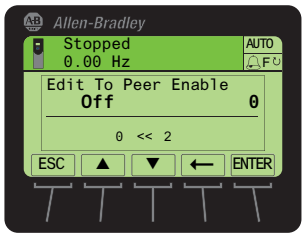
IMPORTANT Because of the 32-bit REAL (floating point) Reference, the following method works only if the drives transmitting and receiving are PowerFlex 750-Series drives. Peer-to-peer communication only works between drives with a 20-750-ENETR option module or PowerFlex 755 drives with the embedded EtherNet/IP adapter.

Follow these steps to set up the master (broadcast) side of simple peer I/O.

1. Set **Parameters 89 - [To Peer Period]** and **90 - [To Peer Skip]** as desired for your application.

   Parameter 89 controls how frequently the adapter will transmit data when it is changing. Parameter 90 controls how frequently the adapter will transmit data when it is **not** changing.

2. Set **Parameter 91 - [To Peer Enable]** to a value of '1' (Cmd/Ref).



Value	Setting
0	Off (Default)
1	Cmd/Ref
2	Custom

Follow these steps to set up the slave (receiver) side of simple peer I/O.

1. Set **Parameter 80 - [Fr Peer Timeout]** to a suitable timeout value for your application.

   This value should be greater than the product of **Parameter 89 - [To Peer Period]** and **Parameter 90 - [To Peer Skip]** in the transmitting drive.

2. Set **Parameters 81 - [Fr Peer Addr 1]** through **84 - [Fr Peer Addr 4]** to the IP address of the drive transmitting peer I/O.

3. In each PowerFlex 750-Series slave drive, set drive parameter 308 - [Direction Mode] to '0' (Unipolar) to ensure that it properly follows the master drive's speed reference and commanded direction.

4. Set **Parameter 85 - [Fr Peer Enable]** to a value of '1' (Cmd/Ref).

Custom Peer I/O Configuration

Peer I/O also allows more flexibility in sending custom data over the network, but requires more configuration.

IMPORTANT	Because of the 32-bit REAL (floating point) Reference, the following method works only if the drives transmitting and receiving are PowerFlex 750-Series drives.

Follow these steps to set up the master (broadcast) side of custom peer I/O.

1. Decide how many Datalink parameters you want to transmit. Set **Parameter 87 - [DLs To Peer Cfg]** to that value.
2. Determine how the Datalinks are allocated.

   The highest numbered of the 16 Datalinks are allocated to peer I/O. For example, if **Parameter 87 - [DLs To Peer Cfg]** is set to '3', then Datalinks 14, 15, and 16 are allocated to peer I/O. To avoid an overlap between Master-Slave and peer I/O, make sure that **Parameter 35 - [DLs To Net Act]** plus **Parameter 87 - [DLs To Peer Cfg]** does not total more than 16.
3. Set **Parameters 17** through **32 - [DL To Net 01-16]** to the parameters you want to transmit, based on the allocation in step 2.
4. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder so that changes to **Parameter 87 - [DLs To Peer Cfg]** take effect.
5. Set **Parameters 89 - [To Peer Period]** and **90 - [To Peer Skip]** as required for your application.

   Parameter 89 controls how frequently the adapter will transmit data when it is changing. Parameter 90 controls how frequently the adapter will transmit data when it is **not** changing.
6. Set **Parameter 91 - [To Peer Enable]** to a value of '2' (Custom).

Follow these steps to set up the slave (receiver) side of custom peer I/O.

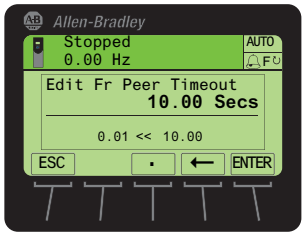
1. Decide how many pieces of data (Logic Command, Reference, and Datalink parameters) you want to receive and set **Parameter 76 - [DLs Fr Peer Cfg]** to that value.

   This must match the number of parameters transmitted by the master.
2. Determine how the Datalinks are allocated.

   The highest numbered of the 16 Datalinks are allocated to peer I/O. For example, if **Parameter 76 - [DLs Fr Peer Cfg]** is set to '3', Datalinks 14, 15, and 16 are allocated to peer I/O. To avoid an overlap between Master-Slave and peer I/O, make sure that **Parameter 34 - [DLs From Net Act]** plus **Parameter 76 - [DLs Fr Peer Cfg]** does not total more than 16.
3. Set **Parameters 1** through **16 - [DL From Net 01-16]** to the parameters you want to receive, based on the allocation in step 2.

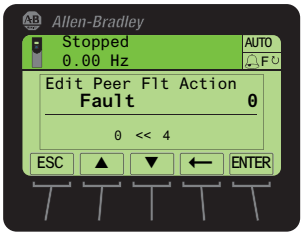
4. Set **Parameter 80 - [Fr Peer Timeout]** to a timeout value for your application.

   This value should be greater than the product of **Parameter 89 - [To Peer Period]** and **Parameter 90 - [To Peer Skip]** in the transmitting drive.



5. Set **Parameter 56 - [Peer Flt Action]** to the desired action if peer I/O data is not received before the timeout is reached.

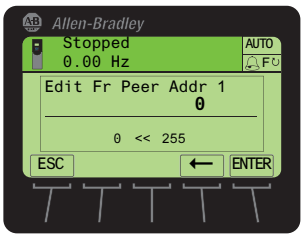
ATTENTION: Risk of injury or equipment damage exists. **Parameter 56 - [Peer Flt Action]** lets you determine the action of the adapter and connected drive if the adapter is unable to communicate with the designated peer. By default, this parameter faults the drive. You may configure this parameter so that the drive continues to run, however, precautions should be taken to verify that the setting of this parameter does not create a hazard of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

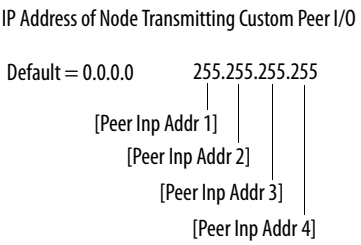


Value	Description
0	Fault (Default)
1	Stop
2	Zero Data
3	Hold Last
4	Send Flt Cfg

For more details about fault action, see Setting a Fault Action on page 38.

6. Set **Parameters 81 - [Fr Peer Addr 1]** through **84 - [Fr Peer Addr 4]** to the IP address of the drive transmitting the custom peer I/O.




IP Address of Node Transmitting Custom Peer I/O
Default = 0.0.0.0
255.255.255.255
[Peer Inp Addr 1]
[Peer Inp Addr 2]
[Peer Inp Addr 3]
[Peer Inp Addr 4]

7. If a Logic Command is being sent, use **Parameter 78 - [Logic Src Cfg]** to set the number of the Datalink that contains the Logic Command within the range defined by **Parameter 76 - [DLs Fr Peer Cfg]**.

For example, if **Parameter 76 - [DLs Fr Peer Cfg]** is set to receive five Datalinks (Datalinks 12 through 16) and the first of those five Datalinks (Datalink 12) contains the Logic Command, set **Parameter 78 - [Logic Src Cfg]** to a value of '1'. Otherwise, set Parameter 78 to a value of '0'. For Logic Command bit definitions, see Appendix D or the drive documentation.

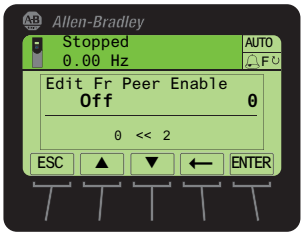
8. If a Reference is being sent, use **Parameter 79 - [Ref Src Cfg]** to set the number of the Datalink that contains the Reference within the range defined by **Parameter 76 - [DLs Fr Peer Cfg]**.

   For example, if **Parameter 76 - [DLs Fr Peer Cfg]** is set to receive five Datalinks (Datalinks 12 through 16) and the second of those five Datalinks (Datalink 13) contains the Reference, set **Parameter 79 - [Ref Src Cfg]** to a value of '2'. Otherwise, set Parameter 79 to a value of '0'.

9. In each PowerFlex 750-Series slave drive, set drive parameter 308 - [Direction Mode] to '0' (Unipolar) to be sure that it properly follows the master drive's speed reference and commanded direction.

10. Reset the adapter by power cycling the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder so that changes to **Parameter 76 - [DLs Fr Peer Cfg]** take effect.

11. Set **Parameter 85 - [Fr Peer Enable]** to a value of '2' (Custom).



Value	Setting
0	Off (Default)
1	Cmd/Ref
2	Custom

Setting a Fault Action

By default, when communication is disrupted (for example, the network cable is disconnected), the controller is idle (in program mode or faulted), and/or peer I/O or explicit messaging for drive control is disrupted, the drive responds by faulting if it is using I/O from the network. You can configure a different response to these faults:

- Disrupted I/O communication by using **Parameter 54 - [Comm Flt Action]**.
- An idle controller by using **Parameter 55 - [Idle Flt Action]**.
- Disrupted peer I/O by using **Parameter 56 - [Peer Flt Action]**.
- Disrupted explicit messaging for drive control via PCCC, the CIP Register Object or the CIP Assembly Object by using **Parameter 57 - [Msg Flt Action]**.

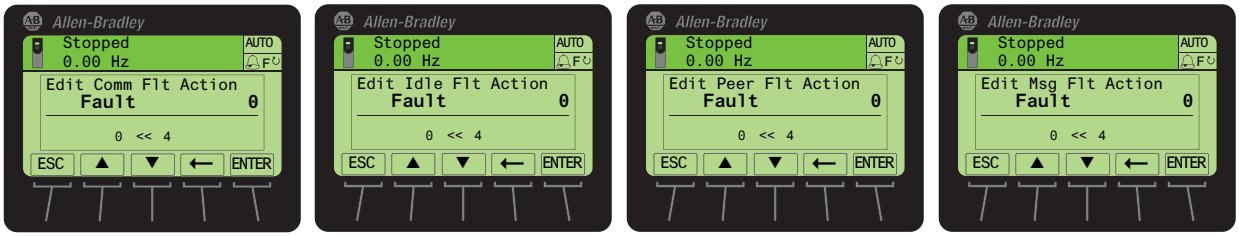
ATTENTION: Risk of injury or equipment damage exists. Embedded adapter **Parameters 54 - [Comm Flt Action]**, **55 - [Idle Flt Action]**, **56 - [Peer Flt Action]**, and **57 - [Msg Flt Action]** respectively let you determine the action of the adapter and drive if communication is disrupted, the controller is idle, peer I/O is disrupted, or explicit messaging for drive control is disrupted. By default, these parameters fault the drive. You may configure these parameters so that the drive continues to run, however, precautions should be taken to verify that the settings of these parameters do not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected network cable, controller in idle state or explicit message control disruption).

Changing the Fault Action

Set the values of **Parameters 54 - [Comm Flt Action]**, **55 - [Idle Flt Action]**, **56 - [Peer Flt Action]**, and **57 - [Msg Flt Action]** to an action that meets your application requirements.

Value	Action	Description
0	Fault	The drive is faulted and stopped. (Default)
1	Stop	The drive is stopped, but not faulted.
2	Zero Data	The drive is sent '0' values for data. This does not command a stop.
3	Hold Last	The drive continues in its present state.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters (**Parameters 58 - [Flt Cfg Logic]**, **59 - [Flt Cfg Ref]**, and **60 - [Flt Cfg DL 01]** through **75 - [Flt Cfg DL 16]**).

Figure 5 - Edit Fault Action HIM Screens



Changes to these parameters take effect immediately. A reset is not required.

If communication is disrupted and then re-established, the drive will automatically receive commands over the network again.

Setting the Fault Configuration Parameters

When setting **Parameter 54 - [Comm Flt Action]**, **55 - [Idle Flt Action]**, **56 - [Peer Flt Action]** or **Parameter 57 - [Msg Flt Action]** to 'Send Flt Cfg', the values in the following parameters are sent to the drive after a communication fault, idle fault, peer I/O fault, and/or explicit messaging for drive control fault

occurs. You must set these parameters to values required by your application.

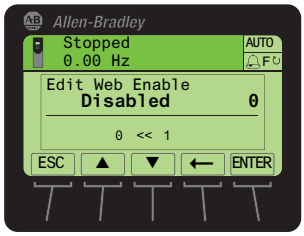
Adapter Parameter	Description
Parameter 58 - [Flt Cfg Logic]	A 32-bit value sent to the drive for Logic Command.
Parameter 59 - [Flt Cfg Ref]	A 32-bit REAL (floating point) value sent to the drive for Reference.
Parameter 60 - [Flt Cfg DL 01] through Parameter 75 - [Flt Cfg DL 16]	A 32-bit integer value sent to the drive for a Datalink. If the destination of the Datalink is a REAL (floating point) parameter, you must convert the desired value to the binary representation of the REAL value. (An internet search of 'hex to float' provides a link to a tool to do this conversion.)

Changes to these parameters take effect immediately. A reset is not required.

Setting Web Access Control

By using a web browser to access the IP address set for the adapter, you can view the adapter web pages for information about the adapter, the drive, and other DPI devices connected to the drive, such as HIMs or converters.

By default, the adapter web pages are disabled. To enable the adapter web pages, set **Parameter 52 - [Web Enable]** to '1' (Enabled) and then reset the adapter for the change to take effect.



Value	Description
0	Disabled (Default)
1	Enabled

For more details on the adapter's web pages, see Chapter 8, Viewing the Adapter Web Pages.

The adapter can be configured to automatically send e-mail messages to desired addresses when selected drive faults occur and/or are cleared, and/or when the adapter takes a communication or idle fault action.

Bit 0 of **Parameter 53 - [Web Features]** is used to protect the configured settings for e-mail messaging. By default, settings are not protected and the user can make changes. To protect the configured settings, set the value of E-mail Cfg Bit 0 to '0' (Disabled). You can unprotect the configuration by changing Bit 0 back to '1' (Enabled). E-mail messaging will always remain active regardless of whether or not its settings are protected—unless e-mail messaging was **never** configured. For more information about configuring adapter e-mail messaging or to stop e-mail messages, see Configure E-mail Notification Web Page on page 118.

Bit	Description
0	E-mail Cfg (Default = 1 = Enabled)
1…15	Not Used

Bit 0 is the right-most bit. In the example above, it equals '1' (Enabled).

Changes to this parameter take effect immediately. A reset is not required.

Resetting the Adapter

Changes to switch settings and some adapter parameters require that you reset the adapter before the new settings take effect. You can reset the adapter by cycling power to the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.

ATTENTION: Risk of injury or equipment damage exists. If the adapter is transmitting control I/O to the drive, the drive may fault when you reset the adapter. Determine how your drive will respond before resetting the adapter.

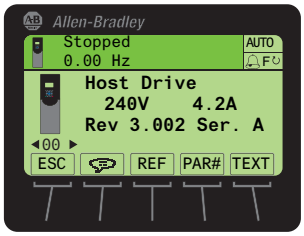
Restoring Adapter Parameters to Factory Defaults

Adapter parameters can be restored in two ways:

- ALL—restores ALL adapter parameters to their factory default values.
- MOST—restores MOST adapter parameters—except the following which are used for network setup:
  - **Parameter 36 - [BOOTP]**
  - **Parameters 38...41 - [IP Addr Cfg 1-4]**
  - **Parameters 42...45 - [Subnet Cfg 1-4]**
  - **Parameters 46...49 - [Gateway Cfg 1-4]**
  - **Parameter 50 - [Net Rate Cfg]**

Follow these steps to restore adapter parameters to their factory default values.

1. Access the Status screen, which is displayed on HIM powerup.



2. Use the 4 or 6 key to scroll to Port 13, which is always the drive port dedicated to the embedded EtherNet/IP adapter.
3. Press the key to display its last-viewed folder.
4. Use the 4 or 6 key to scroll to the MEMORY folder.
5. Use the 2 or 8 key to select Set Defaults.
6. Press the 5 (Enter) key to display the Set Defaults pop-up box.

7. Press the 5 (Enter) key again to display the warning pop-up box to reset parameters to their factory default values.
8. Press the MOST *soft key* to restore MOST parameters to factory defaults, or press the ALL *soft key* to restore ALL parameters. Or press the ESC *soft key* to cancel.

IMPORTANT	When performing a Set Defaults, the drive may detect a conflict and then not allow this function to occur. If this happens, first resolve the conflict and then repeat this Set Defaults procedure. Common reasons for a conflict include the drive running or a controller in Run mode.

9. Reset the adapter by cycling power to the drive or by using the HIM's Reset Device function located in the drive's DIAGNOSTIC folder.

Viewing the Adapter Status Using Parameters

The following parameters provide information about the status of the adapter. You can view these parameters at any time.

Adapter Parameter	Description
34 - [DLs From Net Act]	The number of controller-to-drive Datalinks that are included in the network I/O connection (controller outputs).
35 - [DLs To Net Act]	The number of drive-to-controller Datalinks that are included in the network I/O connection (controller inputs).
37 - [Net Addr Src]	Displays the source from which the adapter IP address is taken. The source is determined by the IP address switch settings shown in Figure 1, and whether **Parameter 36 - [BOOTP]** is enabled or disabled. The source can be one of the following: • '0' (Switches) • '1' (Parameters)—uses the address from **Parameters 38…41 [IP Addr Cfg x]** • '2' (BOOTP)—the default
50 - [Net Rate Act]	The data rate used by the adapter.
86 - [Fr Peer Status]	The status of the consumed peer I/O input connection, which can be one of the following values: 0 = Off 1 = Waiting 2 = Running 3 = Faulted
77 - [DLs Fr Peer Act]	The number of peer-to-drive Datalinks that the drive is expecting.
88 - [DLs To Peer Act]	The number of drive-to-peer Datalinks that the drive is expecting.

Updating the Adapter Firmware

The adapter firmware is contained within the PowerFlex 755 drive firmware. The adapter firmware can be updated over the network or serially through a direct connection from a computer to the drive using a 1203-USB or 1203-SSS serial converter.

When updating firmware over the network, you can use the Allen-Bradley ControlFLASH software tool, the built-in update capability of DriveExplorer Lite or Full software, or the built-in update capability DriveExecutive software.

When updating firmware through a direct serial connection from a computer to a drive, you can use the same Allen-Bradley software tools described above, or you can use HyperTerminal software set to the X-modem protocol.

To obtain a firmware update for this adapter, go to http://www.ab.com/support/abdrives/webupdate. This website contains all firmware update files and associated Release Notes that describe the following items:

- Firmware update enhancements and anomalies
- How to determine the existing firmware revision
- How to update the firmware using ControlFLASH, DriveExplorer, DriveExecutive, or HyperTerminal software

Notes:

Configuring the I/O

This chapter provides instructions on how to configure a Rockwell Automation ControlLogix controller to communicate with the adapter and connected PowerFlex drive.

For information on using a PLC-5, SLC 500, or MicroLogix 1100/1400 controller, see Controller Examples for EtherNet/IP Network Communications with PowerFlex 750-Series Drives, publication 750COM-AT001.

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Using RSLinx Classic	45
ControlLogix Example	46

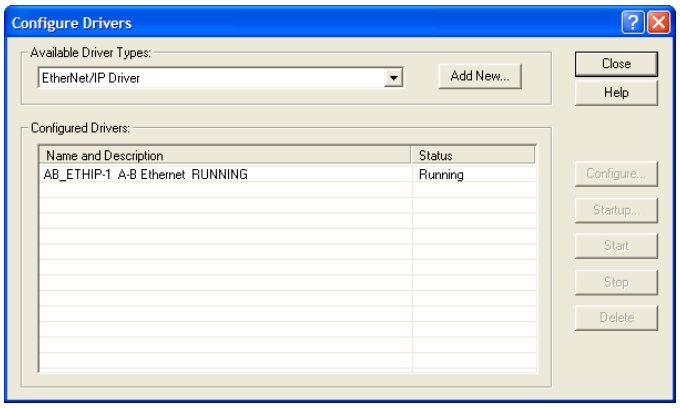
Using RSLinx Classic

RSLinx Classic software, in all its variations (Lite, Gateway, OEM, and so forth), is used to provide a communication link between the computer, network, and controller. RSLinx Classic software requires its network-specific driver to be configured before communication is established with network devices. To configure the RSLinx driver, follow this procedure.

1. Start RSLinx Classic software.
2. From the Communications menu, choose Configure Drivers to display the Configure Drivers dialog box.
3. From the Available Driver Types pull-down menu, choose EtherNet/IP Driver.
4. Click Add New to display the Add New RSLinx Driver dialog box.
5. Use the default name or type a name.
6. Click OK.

   The 'Configure driver:' dialog box appears.
7. Depending on your application, select either the browse local or remote subnet option.
8. Click OK.

The Configure Drivers dialog box reappears with the new driver in the Configured Drivers list.



9. Click Close to close the Configure Drivers dialog box.
10. Keep RSLinx software running and verify that your computer recognizes the drive.
    a. From the Communications menu, choose RSWho.
    b. In the menu tree, click the '+' next to the Ethernet driver.

    If the 'EtherNet/IP Driver' cannot see your drive, as an alternative, use either the 'Ethernet devices' or 'Remote Devices via Linx Gateway' RSLinx driver.

ControlLogix Example

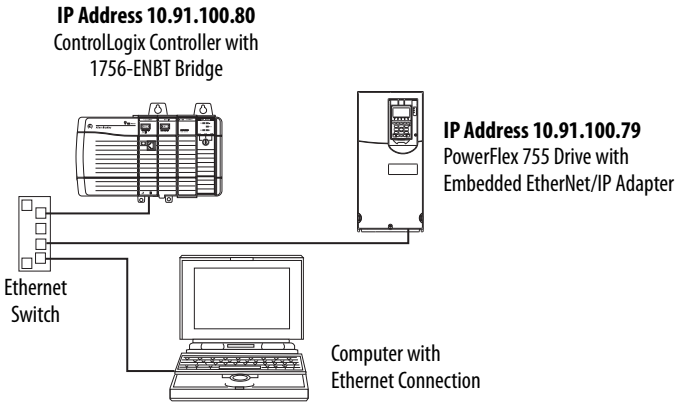
The example in this section is for a Master-Slave hierarchy. The ControlLogix controller, firmware revision 19.00 or later, and the PowerFlex 755 drive, firmware 2.003 or later, also support 'Integrated Motion on the EtherNet/IP network' operation. For details to set up 'Integrated Motion on the EtherNet/IP network' operation, see Integrated Motion on the EtherNet/IP Network, publication MOTION-UM003.

TIP For best reliability in 'Integrated Motion on the EtherNet/IP network' applications, we recommend that you always use Rockwell Automation Cat5e shielded Ethernet cable.

Example Network

After the adapter is configured, the drive and adapter will be a single node on the network. This section provides the steps needed to configure a simple EtherNet/IP network (see Figure 6). In our example, we will configure a 1756-ENBT (Series A) bridge to communicate with a drive using Logic Command/Status, Reference/Feedback, and 32 Datalinks (16 to read and 16 to write) over the network.

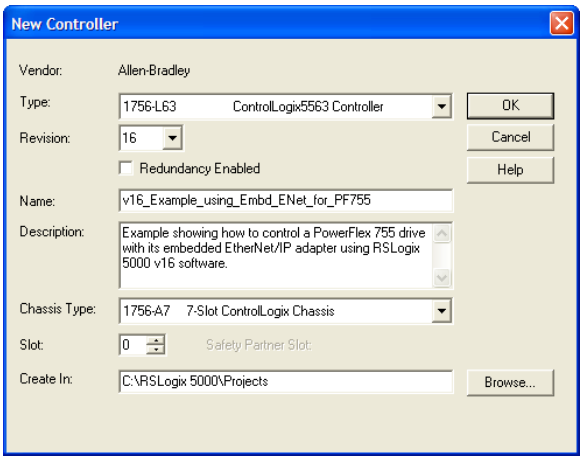
Figure 6 - Example ControlLogix Controller EtherNet/IP Network



Adding the Bridge to the I/O Configuration

To establish communications between the controller and adapter over the network, you must first add the ControlLogix controller and its bridge to the I/O configuration.

1. Start RSLogix 5000 software.
2. From the File menu, choose New to display the New Controller dialog box.



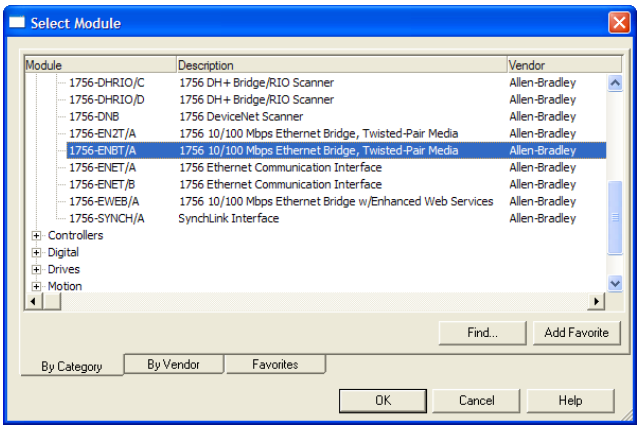
   a. Choose the appropriate choices for the fields in the dialog box to match your application.
   b. Click OK.

      The RSLogix 5000 dialog box reappears with the treeview in the left pane.

3. In the treeview, right-click the I/O Configuration folder and choose New Module.

   The Select Module dialog box appears.

4. Expand the Communications group to display all of the available communication modules.



5. In the list, select the EtherNet/IP bridge used by your controller.

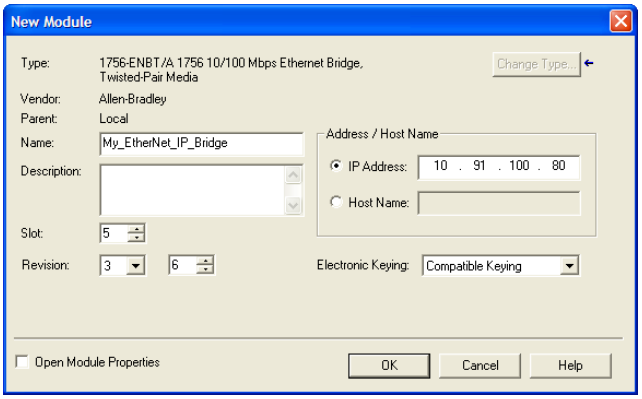
   In this example, we use a 1756-ENBT EtherNet/IP Bridge (Series A), so the 1756-ENBT/A option is selected.

6. Click OK.

7. In the Select Major Revision pop-up dialog box, select the major revision of its firmware.

8. Click OK.

   The bridge's New Module dialog box appears.



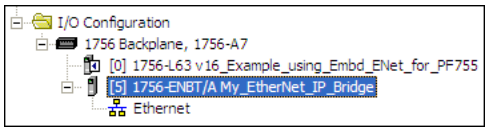
9. Edit the following:

Box	Setting
Name	A name to identify the bridge.
Description	Optional – description of the bridge.
Revision	Click Change to change Revision or Electronic Keying. The minor revision of the firmware in the bridge. (You already set the major revision by selecting the bridge series in step 7.)
Electronic Keying	**Compatible Keying**. The 'Compatible Keying' setting for Electronic Keying verifies that the physical module is consistent with the software configuration before the controller and bridge make a connection. Therefore, be sure that you have set the correct revision in this dialog box. See the online Help for additional information on this and other Electronic Keying settings. If keying is not required, select 'Disable Keying'. Disable keying is recommended.

Box	Setting
IP Address	The IP address of the EtherNet/IP bridge.
Host Name	Not used.
Slot	The slot of the EtherNet/IP bridge in the rack.
Open Module Properties	When this box is checked, clicking OK opens additional module properties dialog boxes to further configure the bridge. When unchecked, clicking OK closes the bridge's New Module dialog box. For this example, uncheck this box.

10. Click OK.

    The bridge is now configured for the EtherNet/IP network, added to the RSLogix 5000 project, and appears in the I/O Configuration folder.



    In our example, a 1756-ENBT bridge appears under the I/O Configuration folder with its assigned name.

There are two ways to add the adapter into the I/O configuration:

- Drive Add-on Profiles (RSLogix 5000 software, version 16.00 or later)
- Generic Profile (RSLogix 5000 software, all versions)

These are described in the following separate sections. If your version of RSLogix 5000 software supports drive Add-on Profiles, we recommend that you use this method.

Using RSLogix 5000 Drive Add-on Profiles, Version 16.00 or Later

When compared to using the Generic Profile (all versions), the RSLogix 5000 drive Add-on Profiles provide these advantages:

- Profiles for specific drives that provide descriptive controller tags for basic control I/O words (Logic Command/Status and Reference/Feedback) **and** Datalinks. Additionally, Datalinks automatically take the name of the drive parameter to which they are assigned. These profiles virtually eliminate I/O mismatch errors and substantially reduce drive configuration time.

- New Drive tab eliminates the need for a separate drive software configuration tool.

- Drive configuration settings are saved as part of the RSLogix 5000 software, version 16.00 or later, project file (.ACD) and also downloaded to the controller.

- Unicast connection (RSLogix 5000 software, version 18.00 or later)

- Drive Add-on Profiles, version 2.01 or later, enable I/O to be added online while the controller is in the Run mode.

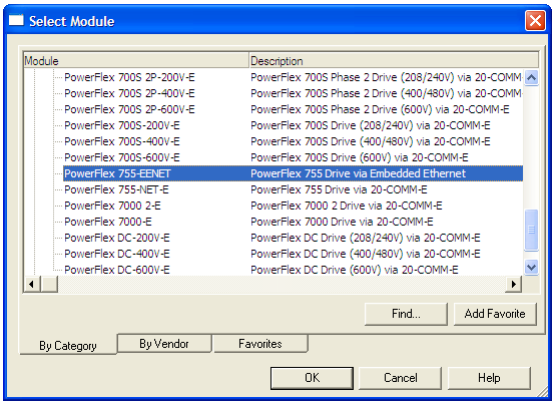
- Drive Add-on Profiles can be updated anytime. When a new drive is used or to benefit from new updates for Add-on Profiles, you will need the newest Add-on Profile update. Go to http://www.ab.com/support/abdrives/webupdate to download the latest RSLogix 5000 drive Add-on Profile.

Add the Drive/Adapter to the I/O Configuration

To transmit data between the bridge and the drive, you must add the drive as a child device to the parent bridge. In this example, RSLogix 5000 software version 16.00 is used with drive Add-on Profile version 3.01. To determine your drive Add-On Profile version, see Allen-Bradley Knowledgebase document #65882.

1. In the treeview, right-click on the bridge and select New Module to display the Select Module dialog box.

   In our example, we right-click on the 1756-ENBT/A bridge. Expand the Drives group to display all of the available drives with their communication adapters.



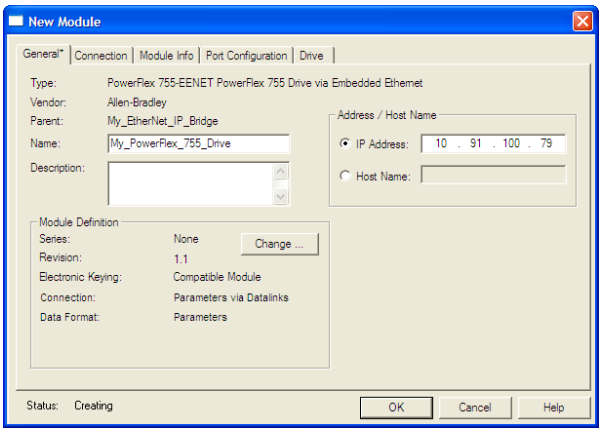
TIP If the PowerFlex drive is not shown, go to www.ab.com/support/abdrives/webupdate and download the latest RSLogix 5000 drive Add-on Profile. Add-on Profile version 4.03 (or later) includes profiles for PowerFlex 750-Series drives with the 20-750-ENETR option module.

2. From the list, select the drive and its connected adapter.

   For this example, we selected 'PowerFlex 755-EENET'.

3. Click OK.

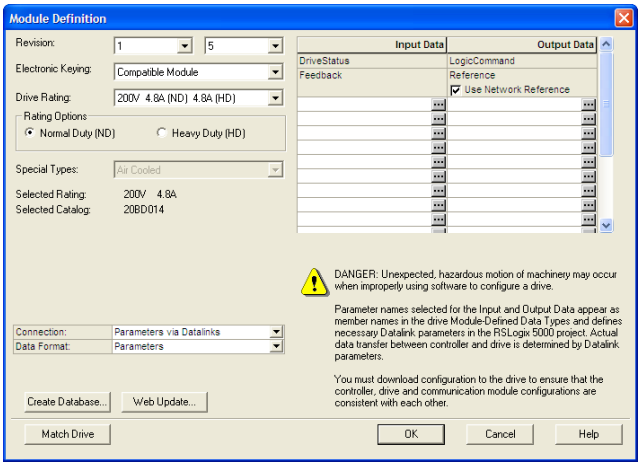
The drive's New Module dialog box appears.



4. On the General tab, edit the following data about the drive/adapter:

Box	Setting
Name	A name to identify the drive.
Description	Optional – description of the drive/adapter.
IP Address	The IP address of the adapter.

5. On the New Module dialog box in the Module Definition section, click Change to launch the Module Definition dialog box and begin the drive/adapter configuration process.


Module Definition
Revision: 1 5
Electronic Keying: Compatible Module
Drive Rating: 200V 4.8A (ND) 4.8A (HD)
Rating Options
Normal Duty (ND)
Heavy Duty (HD)
Special Types: Air Cooled
Selected Rating: 200V 4.8A
Selected Catalog: 20BD014
Input Data
Output Data
DriveStatus
LogicCommand
Feedback
Reference
Use Network Reference
DANGER: Unexpected, hazardous motion of machinery may occur when improperly using software to configure a drive.
Parameter names selected for the Input and Output Data appear as member names in the drive Module-Defined Data Types and defines necessary Datalink parameters in the RSLogix 5000 project. Actual data transfer between controller and drive is determined by Datalink parameters.
You must download configuration to the drive to ensure that the controller, drive and communication module configurations are consistent with each other.
Connection: Parameters via Datalinks
Data Format: Parameters
Create Database...
Web Update...
Match Drive
OK
Cancel
Help

TIP To get the latest RSLogix 5000 drive Add-on Profile, go to http://www.ab.com/support/abdrives/webupdate.

6. In the Module Definition dialog box, edit the following information.

Box	Setting
Revision	The major and minor revision of the firmware (database) in the drive. If the drive's major and minor revision is not available, the drive database is not installed on your computer. To get the correct database revision, use one of the following buttons at the bottom left of the Module Definition dialog box: • **Create Database:** Creates a database from an online network drive. Clicking this button displays an RSLinx RSWho dialog box. Browse to the online drive (for this example, PowerFlex 755), select it, and click OK. The database will be uploaded and stored on the computer. Thereafter, close the Module Definition dialog box and then re-open it to display the new revision. • **Web Update:** When a drive is not available online, opens the Allen-Bradley Drives Web Updates website to download a specific database file. After downloading the file, close the Module Definition dialog box and then re-open it to display the new revision. • **Match Drive:** Use this button when the drive being added to the network matches the drive profile (revision, rating, Datalinks, configuration settings, etc.) of an existing online network drive. Click this button to conveniently create a duplicate drive profile from the online drive, and automatically load this identical information into the Module Definition dialog box. This eliminates the need to manually enter the information each time a new drive with a matching profile is added to the network.
Electronic Keying	**Compatible Module.** The 'Compatible Module' setting for Electronic Keying verifies that the physical module is consistent with the software configuration before the controller and bridge make a connection. Therefore, be sure that you have set the correct revision in this dialog box. See the online Help for additional information on this and other Electronic Keying settings. If keying is not required, select 'Disable Keying'. Drives do not require keying, and so 'Disable Keying' is recommended. When using RSLogix 5000 software, version 20.00 or later, and Automatic Device Configuration (ADC) with Firmware Supervisor upgrade support to store firmware for the drive, always choose 'Exact Match'. When using ADC, see the table on page 63 for more details.
Drive Rating	The voltage and current rating of the drive. If the drive rating is not listed, the drive database is not installed on your computer. To get the drive rating, use the **Create Database**, **Web Update**, or **Match Drive** button described above.
Rating Options	Selects the drive power output required for the application. This must match the drive's actual rating.
Special Types	Reserved for future use.
Connection	**Parameters via Datalinks.** When selecting 'Parameters via Datalinks' (default), the controller tags for the Datalinks use the drive parameter names to which they are assigned. When selecting 'Datalinks', the controller tags for the Datalinks have non-descriptive UserDefinedData[n] names like those used in RSLogix 5000 software, version 15.00.
Data Format	**Parameters.** When the Connection field is set to 'Parameters via Datalinks', 'Parameters' is automatically selected. When the Connection field is set to 'Datalinks', you must select the number of Datalinks required for your application in the 'Data Format' field.
Input Data	Assigns selected drive or connected peripheral parameters to be READ by the controller using DL To Net Datalinks. See steps 6a through 6e below for details.
Output Data	Assigns selected drive or connected peripheral parameters to be WRITTEN by the controller using DL From Net Datalinks. See steps 6a through 6e below for details.
Use Network Reference	Conveniently selects the speed reference for the drive to come from the network. This box is checked by default.

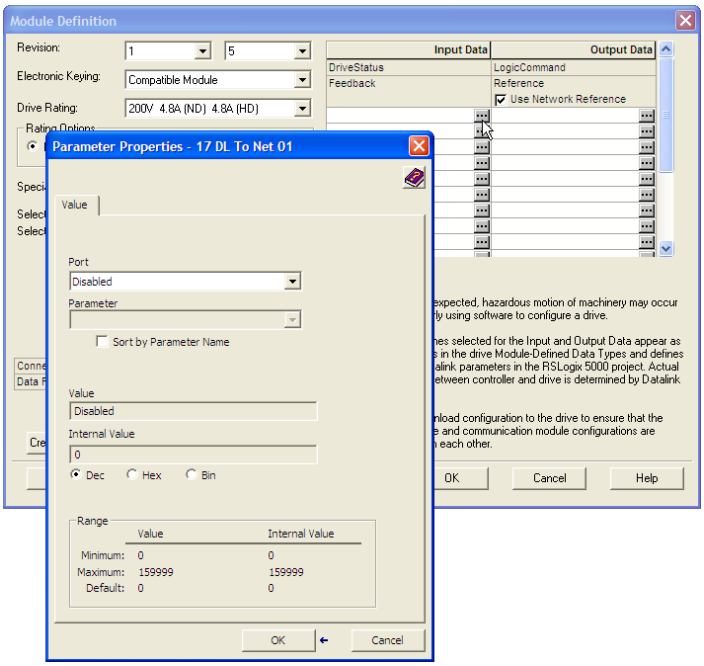
On the Module Definition dialog box, notice that the automatically-assigned controller tags DriveStatus, Feedback, LogicCommand, and Reference are always used.

However, when using Datalinks you must still assign adapter **Parameters 01…16 - [DL From Net 01-16]** and **Parameters 17…32 - [DL To Net 01-16]** to point to the appropriate drive or connected peripheral

parameters. The procedure to configure the Datalinks on the Module Definition dialog box for the Input Data and Output Data is the same.

a. Click the ... button in the topmost blank row to display the Parameter Properties dialog box for the corresponding Datalink.

IMPORTANT Always use the Datalink parameters in consecutive numerical order, starting with the first parameter. (For example, use Parameters 01, 02, and 03 to configure three Datalinks to write data and/or Parameters 17, 18, 19, 20, and 21 to configure five Datalinks to read data.) Otherwise, the network I/O connection will be larger than necessary, which needlessly increases controller response time and memory usage.



b. From the Port field pull-down menu, choose the port of the device to which this Datalink will be assigned (for this example, Port 0, the PowerFlex 755 drive).

c. From the Parameter field pull-down menu for the selected device, choose the parameter to which this Datalink will point (for this example, drive parameter 370 - [Stop Mode A]).

d. Click OK to complete configuration of the Datalink.

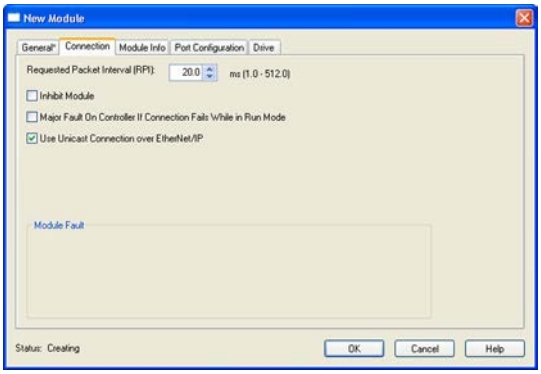
The name of the parameter that this Datalink points to is now shown in the row on the Module Definition dialog box.

e. Repeat steps 6a through 6d for each Datalink being configured.

7. Click OK on the Module Definition dialog box to save the drive and adapter configuration, and close the dialog box.

The drive's New Module dialog box reappears.

8. Click the Connection tab.



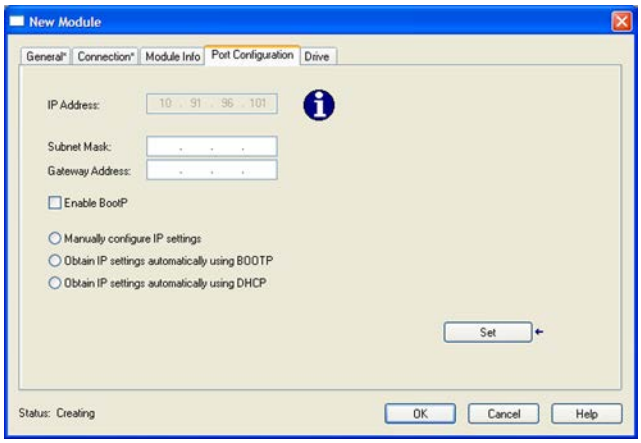
9. In the 'Requested Packet Interval (RPI)' box, set the value to 2.0 milliseconds or greater (default is 20.0 milliseconds).

   This value determines the maximum interval that a controller should use to move data to and from the adapter. To conserve bandwidth, use higher values for communicating with low priority devices.

   The 'Inhibit Module' box, when checked, inhibits the module from communicating with the RSLogix 5000 project. When the 'Major Fault On' box is checked, a major controller fault will occur when the module's connection fails while the controller is in the Run Mode. For this example, leave the 'Inhibit Module' and 'Major Fault On' boxes unchecked.

   Unicast support has been added to RSLogix 5000 software, version 18.00 or later. Unicast is recommended whenever possible. For the benefits of unicast operation, see Preparing for an Installation on page 17.

10. Click the Port Configuration tab.



11. In the Port Configuration tab dialog box, edit the following information.

Box	Setting
IP Address	The IP address of the adapter that was already set in the General tab. This field is not configurable (grayed out).
Subnet Mask	The Subnet Mask configuration setting of the network. This setting must match the setting of other devices on the network (for example, 255.255.255.0).
Gateway Address	The Gateway Address configuration setting of the network. This setting must match the setting of other devices on the network (for example, 10.91.100.1).

Box	Setting
Enable BootP	When this box is checked, BOOTP is enabled in the adapter and will ignore the IP address set in the General tab. When unchecked, the controller uses the set IP address. This is another method to enable/disable BOOTP in the adapter. For this example, leave this box unchecked.

12. Click Set to save the Port Configuration information which sets the corresponding offline Subnet Cfg x and Gateway Cfg x parameters in the adapter.

13. Click OK on the New Module dialog box.

    The new node ('My_PowerFlex_755_Drive' in this example) now appears under the bridge ('My_EtherNet_IP_Bridge' in this example) in the I/O Configuration folder. If you double-click on the Controller Tags, you will see that module-defined data types and tags have been automatically created (Figure 7 and Figure 8). Note that all tag names are defined and Datalinks include the assigned drive parameter name. After you save and download the configuration, these tags allow you to access the Input and Output data of the drive via the controller's ladder logic.

Figure 7 - Controller Input Tags

Name	Value	Data Type
My_PowerFlex_755_Drive:I	{...}	AB:PowerFlex7...
My_PowerFlex_755_Drive:I.DriveStatus	2#0000_0000_0000_...	DINT
My_PowerFlex_755_Drive:I.DriveStatus_Ready	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Active	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_CommandDir	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_ActualDir	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Accelerating	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Decelerating	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Alarm	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Faulted	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_AtSpeed	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Manual	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_SpdRefBit0	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_SpdRefBit1	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_SpdRefBit2	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_SpdRefBit3	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_SpdRefBit4	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Running	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Jogging	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Stopping	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_DCBraking	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_DBActive	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_SpeedMode	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_PositionMode	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_TorqueMode	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_AtZeroSpeed	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_AtHome	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_AtLimit	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_CurrLimit	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_BusFrqReg	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_EnableOn	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_MotorOL	0	BOOL
My_PowerFlex_755_Drive:I.DriveStatus_Regen	0	BOOL
My_PowerFlex_755_Drive:I.Feedback	0.0	REAL
My_PowerFlex_755_Drive:I.StopModeA	0	DINT
My_PowerFlex_755_Drive:I.StopModeB	0	DINT
My_PowerFlex_755_Drive:I.AccelTime1	0.0	REAL
My_PowerFlex_755_Drive:I.AccelTime2	0.0	REAL
My_PowerFlex_755_Drive:I.DecelTime1	0.0	REAL
My_PowerFlex_755_Drive:I.DecelTime2	0.0	REAL
My_PowerFlex_755_Drive:I.JogAccDecTime	0.0	REAL
My_PowerFlex_755_Drive:I.JogSpeed1	0.0	REAL
My_PowerFlex_755_Drive:I.JogSpeed2	0.0	REAL
My_PowerFlex_755_Drive:I.PresetSpeed1	0.0	REAL
My_PowerFlex_755_Drive:I.PresetSpeed2	0.0	REAL
My_PowerFlex_755_Drive:I.PresetSpeed3	0.0	REAL
My_PowerFlex_755_Drive:I.PresetSpeed4	0.0	REAL
My_PowerFlex_755_Drive:I.PresetSpeed5	0.0	REAL
My_PowerFlex_755_Drive:I.PresetSpeed6	0.0	REAL
My_PowerFlex_755_Drive:I.PresetSpeed7	0.0	REAL

Figure 8 - Controller Output Tags

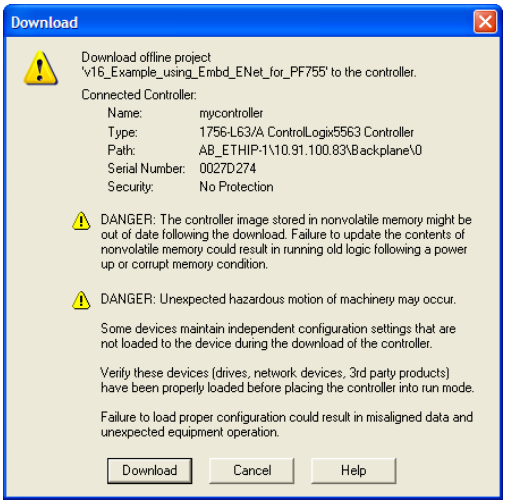
Name	Value	Data Type
My_PowerFlex_755_Drive:O	{...}	AB:PowerFlex7...
My_PowerFlex_755_Drive:O.LogicCommand	2#0000_0000_0000_...	DINT
My_PowerFlex_755_Drive:O.LogicCommand_Stop	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_Start	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_Jog1	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_ClearFaults	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_Forward	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_Reverse	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_Manual	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_AccelTime1	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_AccelTime2	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_DecelTime1	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_DecelTime2	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_SpdRefSel0	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_SpdRefSel1	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_SpdRefSel2	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_CoastStop	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_CLimitStop	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_Run	0	BOOL
My_PowerFlex_755_Drive:O.LogicCommand_Jog2	0	BOOL
My_PowerFlex_755_Drive:O.Reference	0.0	REAL
My_PowerFlex_755_Drive:O.StopModeA	0	DINT
My_PowerFlex_755_Drive:O.StopModeB	0	DINT
My_PowerFlex_755_Drive:O.AccelTime1	0.0	REAL
My_PowerFlex_755_Drive:O.AccelTime2	0.0	REAL
My_PowerFlex_755_Drive:O.DecelTime1	0.0	REAL
My_PowerFlex_755_Drive:O.DecelTime2	0.0	REAL
My_PowerFlex_755_Drive:O.JogAccDecTime	0.0	REAL
My_PowerFlex_755_Drive:O.JogSpeed1	0.0	REAL
My_PowerFlex_755_Drive:O.JogSpeed2	0.0	REAL
My_PowerFlex_755_Drive:O.PresetSpeed1	0.0	REAL
My_PowerFlex_755_Drive:O.PresetSpeed2	0.0	REAL
My_PowerFlex_755_Drive:O.PresetSpeed3	0.0	REAL
My_PowerFlex_755_Drive:O.PresetSpeed4	0.0	REAL
My_PowerFlex_755_Drive:O.PresetSpeed5	0.0	REAL
My_PowerFlex_755_Drive:O.PresetSpeed6	0.0	REAL
My_PowerFlex_755_Drive:O.PresetSpeed7	0.0	REAL

Save the I/O Configuration to the Controller

After adding the bridge and drive/adapter to the I/O configuration, you must download the configuration to the controller. You should also save the configuration to a file on your computer.

1. From the Communications menu in the RSLogix 5000 dialog box, choose Download.

   The Download dialog box appears.


Download
Download offline project
'v16_Example_using_Embd_ENet_for_PF755' to the controller.
Connected Controller:
Name: mycontroller
Type: 1756-L63/A ControlLogix5563 Controller
Path: AB_ETHIP-1\10.91.100.83\Backplane\0
Serial Number: 0027D274
Security: No Protection
DANGER: The controller image stored in nonvolatile memory might be out of date following the download. Failure to update the contents of nonvolatile memory could result in running old logic following a power up or corrupt memory condition.
DANGER: Unexpected hazardous motion of machinery may occur.
Some devices maintain independent configuration settings that are not loaded to the device during the download of the controller.
Verify these devices (drives, network devices, 3rd party products) have been properly loaded before placing the controller into run mode.
Failure to load proper configuration could result in misaligned data and unexpected equipment operation.
Download
Cancel
Help

TIP If a message box reports that RSLogix 5000 software is unable to go online, find your controller in the Who Active dialog box. From the Communications menu, choose Who Active. After finding and selecting the controller, click Set Project Path to establish the path. If your controller does not appear, you need to add or configure the EtherNet/IP driver with RSLinx software. See Using RSLinx Classic on page 45 and the RSLinx online help for details.

2. Click Download to download the configuration to the controller.

   When the download is successfully completed, RSLogix 5000 software goes into the Online mode and the I/O Not Responding box in the upper-left of the dialog box should be flashing green. Also, a yellow warning symbol ⚠ should be displayed on the I/O Configuration folder in the treeview and on the drive profile.

   If the controller was in Run Mode before clicking Download, RSLogix 5000 software prompts you to change the controller mode back to Remote Run. In this case, choose the appropriate mode for your application. If the controller was in Program Mode before clicking Download, this prompt will not appear.

3. From the File menu, choose Save.

   If this is the first time you saved the project, the Save As dialog box appears.

   a. Navigate to a folder.

   b. Type a file name.

   c. Click Save to save the configuration as a file on your computer.

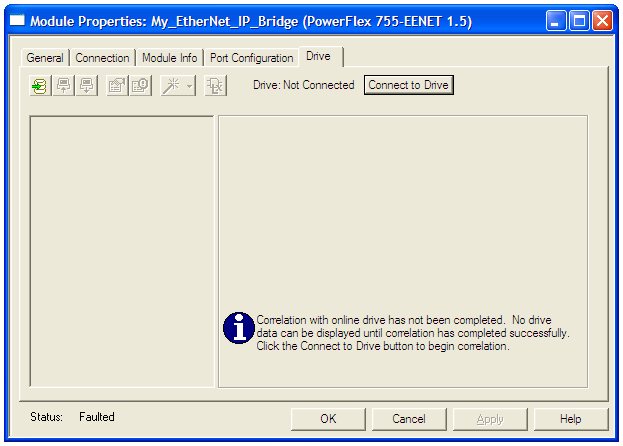
   To be sure that present project configuration values are saved, RSLogix 5000 software prompts you to upload them. Click Yes to upload and save the values.

Correlate the Drive with the Controller

You must now correlate the drive settings to the RSLogix 5000 project I/O settings so that they match. This requires loading the project I/O settings into the drive.

1. In the treeview under I/O Configuration, right-click on the drive profile (for this example, 'My_PowerFlex_755_Drive') and choose Properties.

2. Click the Drive tab.

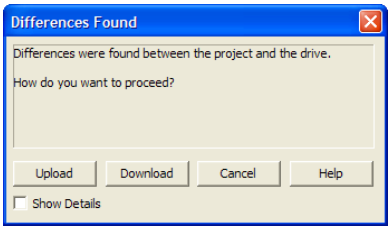


3. Click Connect to Drive to begin the correlation process.

   After the drive configuration data has been verified, a pop-up dialog box will appear to synchronize ports from the online drive to the project to be sure that the correct Datalinks are assigned.

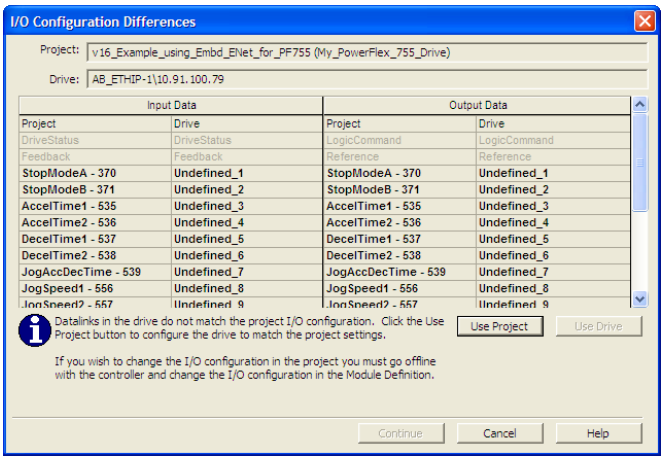
4. Click OK.

   If the Differences Found dialog box appears—which is typical, click Download. This will download the project settings from the controller to the drive and its connected adapter. If Upload is clicked, the drive and adapter settings are uploaded to the controller.



TIP On subsequent connections to the drive (after the initial download), click Upload.

5. The I/O Configuration Differences dialog box appears.



6. To match the Datalinks in the drive to the project I/O configuration, click Use Project.

   After the datalinks have been matched, the Input Data and Output Data columns are grayed out.

7. Click Continue.

   A series of download dialog boxes appear, which may take a minute to complete. Thereafter, the I/O OK box in the upper-left of the RSLogix 5000 dialog box should now be steady green and the yellow warning symbols in the treeview under the I/O Configuration folder and drive profile should be gone.

   After a few moments, the Module Properties dialog box should indicate that it is connected to the online drive.

8. Click OK to close the Module Properties dialog box for the drive.

Using Automatic Device Configuration (ADC) with RSLogix 5000 Software, Version 20.00 or Later

Automatic Device Configuration (ADC) is an 'RSLogix 5000 software, version 20.00 or later, feature' that supports the automatic download of configuration data. This occurs, if necessary, as the Logix controller establishes an EtherNet/IP network connection to a PowerFlex 755 drive, firmware revision 4.001 or later, and its associated peripherals.

An RSLogix 5000 software, version 16.00 or later, project (.ACD file) contains the configuration settings for any PowerFlex drives in the project. When the project is downloaded to the Logix controller, these settings are also transferred and reside in the controller's memory. Prior to ADC in RSLogix 5000 software, version 20.00, downloading PowerFlex 755 configuration data was a manual process where the user would open the Drive tab in the respective Drive Add-on Profile (AOP) in RSLogix 5000 software and click the Download icon. ADC in RSLogix 5000 software, version 20.00 or later, now automates the process and saves the user time. It is particularly beneficial in a drive replacement situation when a production line is down.

When enabled, ADC will only occur during the network I/O connection process if it is necessary. A configuration signature is used for each port in the drive and this is checked by the Logix controller during the connection process. If a port's configuration signature matches the corresponding signature inside the controller, then ADC does not need to be performed for that particular port.

IMPORTANT ADC will occur the first time the Logix controller connects to the drive after ADC is enabled. This is necessary to ensure a configuration match, and to generate and write configuration signatures for each port. Future connections made by the Logix controller, such as after a reset or power loss, will first check the configuration signatures to determine if an ADC download is necessary.

TIP Use with select Stratix switches to provide dynamic IP address assignment by port (requires one drive per port). This eliminates the need for the user to manually enter the IP address, Subnet mask, and Gateway address prior to connecting a replacement drive to the Ethernet network.

ADC can also work in tandem with Firmware Supervisor. If Firmware Supervisor is set up and enabled for a drive ('Exact Match' keying must be used), the drive/peripheral will be automatically upgraded (if necessary) prior to any ADC operation for that port.

IMPORTANT **Logix 'owns' the configuration of the drive. ADC will be triggered any time the Logix controller detects a configuration signature mismatch when establishing an EtherNet/IP network I/O connection.**

The use of other configuration tools, such as a HIM, DriveExplorer software, or DriveTools SP software, should be minimized and restricted to monitor-only operation. Any configuration changes made by these tools will cause a configuration signature mismatch the next time the Logix controller connects to the device and ADC will write over any changes made by the other tools. Consider using the Write Mask function (drive Parameter 888 - [Write Mask Cfg]) to prevent tools connected to ports other than the Embedded EtherNet/IP port in a PowerFlex 755 drive from writing to the drive. Any drive configuration changes should be made with the RSLogix 5000 Add-on Profile (AOP).

The use of Explicit Messaging to perform parameter writes in the user's Logix program should be limited to RAM memory by setting the proper Attribute in the MSG instruction. Any writes to parameter nonvolatile storage (EEPROM) memory will clear the configuration signature and cause a mismatch the next time the Logix controller connects to the device. This will trigger ADC, which will write over any changes that were previously made.

TIP When enabling ADC in your control system, adhere to the following recommendations:

- Enable ADC as the last step, that is, after drive configuration and commissioning is completed. This eliminates time being wasted from 'nuisance' ADC downloads being triggered after any parameter changes are made.
- Upload the configuration from a drive prior to enabling ADC for it. This ensures the drive's configuration in the project matches the actual drive.
- Enable and test ADC with one drive prior to enabling it for the entire control system. ADC can be tested by changing a parameter in a port, such as with a HIM, and resetting or cycling power to the drive.

Version 4.01 Drive Add-on Profiles (AOPs)

RSLogix 5000 software, version 20.00 ships with **version 4.01** Drive Add-on Profiles (AOPs). Note the following ADC operating status when using version 4.01 Drive AOPs:

- When adding a new drive, ADC is **enabled** by default for any drive that supports ADC, such as PowerFlex 753 drives with firmware 7.001 or later, or PowerFlex 755 drives with firmware 4.001 or later.

- When converting RSLogix 5000 projects, version 16.00...19.00, to version 20.00 projects (with version 4.01 Drive AOPs), ADC will be **enabled** by default for any drive that supports ADC, such as PowerFlex 753 drives with firmware 7.001 or later using a 20-750-ENETR EtherNet/IP option module, or PowerFlex 755 drives with firmware 4.001 or later.

RSLogix 5000 software, version 20.00 can be updated with version 4.02 (or later) Drive AOPs, which are available via free download at:
http://www.ab.com/support/abdrives/webupdate/software.html

TIP To identify the Drive AOP version, click the icon in the upper-left corner of the Module Properties dialog box and select 'About Module Profile'.

Version 4.02 (or later) Drive Add-on Profiles (AOPs)

Version 4.02 Drive AOPs require user action to enable ADC. This helps verify that the user understands ADC operation prior to turning it on. Note the following ADC operating status when using version 4.02 (or later) Drive AOPs:

- When adding a new drive, ADC is **disabled** by default for any drive that supports ADC, such as PowerFlex 753 drives with firmware 7.001 or later using a 20-750-ENETR EtherNet/IP option, or PowerFlex 755 drives with firmware 4.001 or later.

- When converting an earlier RSLogix 5000 project to a version 20.00 project that has been updated with version 4.02 (or later) Drive AOPs or when updating a project created with version 4.01 Drive AOPs, any ADC settings will be **passed through as-is** for drives that support ADC. For example:

  - If ADC was disabled for a drive in a previous project, it will remain disabled.
  - If ADC was enabled for a drive using version 4.01 Drive AOPs and that project was later updated to version 4.02 (or later) Drive AOPs, it will remain enabled.

Version 4.02 (or later) Drive AOPs also have an ADC icon on the Drive tab to show general ADC enable/disable status for the drive:

Icon	Meaning
	No ports on the drive have ADC enabled.
	At least one port on the drive has ADC enabled.
	ADC is not supported.

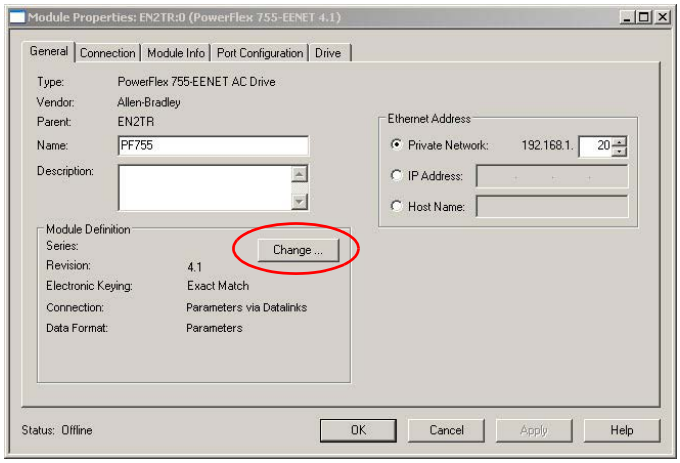
Clicking on the ADC icon will launch the ADC configuration dialog box. This provides a single, convenient location to enable/disable ADC for any of the ports on the drive.

Configure a PowerFlex 755 Drive for ADC

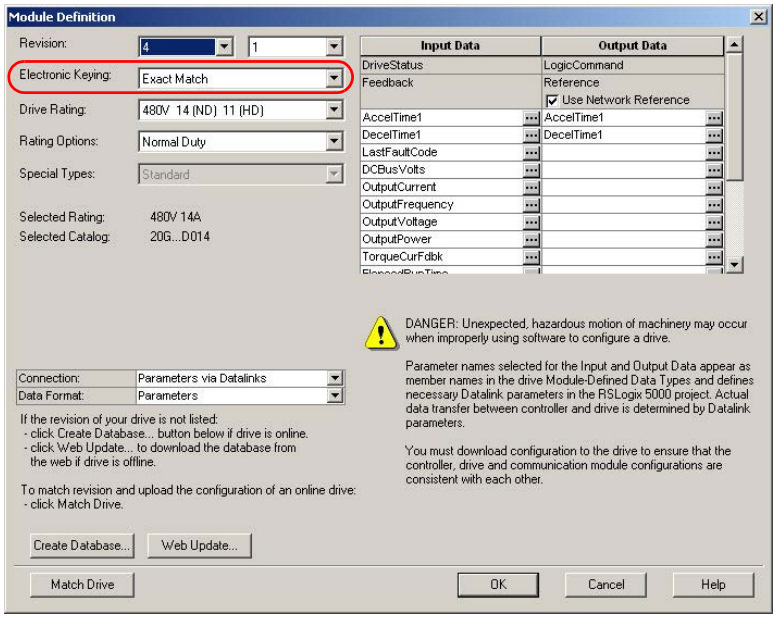
IMPORTANT ADC is supported by only PowerFlex 753 drives with firmware 7.001 or later, and PowerFlex 755 drives with firmware 4.001 or later.

ADC is configured within the AOP of the PowerFlex 755 drive. Start by creating or opening a PowerFlex 755 drive in the RSLogix 5000 I/O Configuration folder.

1. Open the drive General tab dialog box.



2. Click Change to open the Module Definition dialog box.
3. Select the appropriate Electronic Keying for your application.


Module Definition
Revision: 4 1
Electronic Keying: Exact Match
Drive Rating: 480V 14 (ND) 11 (HD)
Rating Options: Normal Duty
Special Types: Standard
Selected Rating: 480V 14A
Selected Catalog: 20G...D014
Input Data
Output Data
DriveStatus
LogicCommand
Feedback
Reference
Use Network Reference
AccelTime1
DecelTime1
LastFaultCode
DCBusVolts
OutputCurrent
OutputFrequency
OutputVoltage
OutputPower
TorqueCurFdbk
DANGER: Unexpected, hazardous motion of machinery may occur when improperly using software to configure a drive.
Parameter names selected for the Input and Output Data appear as member names in the drive Module-Defined Data Types and defines necessary Datalink parameters in the RSLogix 5000 project. Actual data transfer between controller and drive is determined by Datalink parameters.
You must download configuration to the drive to ensure that the controller, drive and communication module configurations are consistent with each other.
Connection: Parameters via Datalinks
Data Format: Parameters
If the revision of your drive is not listed:
- click Create Database... button below if drive is online.
- click Web Update... to download the database from the web if drive is offline.
To match revision and upload the configuration of an online drive:
- click Match Drive.
Create Database...
Web Update...
Match Drive
OK
Cancel
Help

There are three Electronic Keying choices available in the Module Definition dialog box in the Drive AOP, but only two are recommended with ADC.

Electronic Keying Selection	Recommendation
Exact Match	This selection should only be used if: • Your system design specification requires that a replacement drive/peripheral be identical—down to the Minor revision of firmware (*x.xxx*). • You will be implementing Firmware Supervisor upgrade support in addition to ADC. ControlFLASH firmware kits for the revision of firmware used for each drive/peripheral must be installed on the computer running RSLogix 5000 software. Upgrade files can be downloaded from: http://www.ab.com/support/abdrives/webupdate
Compatible Module	When using ADC, this selection should generally not be used. A replacement drive (including peripherals) will need to have the same major firmware revision as the original and the same or later minor revision.
Disabled	This is the typical ADC selection when Firmware Supervisor is not used. When using ADC, this selection should generally not be used. This selection allows a replacement drive to have any different Major (*X.xxx*) and/or Minor (*X.xxx*) firmware revision. It is up to the user to provide a replacement that has a firmware revision later than or equal to the original drive. If a replacement drive with older firmware is used, the ADC download may fail.

Keying for peripherals is managed via the respective Port Properties dialog box for each peripheral.

Electronic Keying for the embedded EtherNet/IP adapter (Port 13 on PowerFlex 755 drives) and DeviceLogix (Port 14) ports are 'Disabled' by default. Both ports do not have individual firmware and are currently managed by the drive's firmware (Port 0). If you set either of these to 'Exact Match', Firmware Supervisor will be unable to locate the upgrade files during setup. If the 'Fault Drive Connection on Peripheral Error' checkbox is selected and there is a mismatch or failure while connecting to or configuring these two ports, the overall ADC process will fail and no I/O connection will be made to the drive.

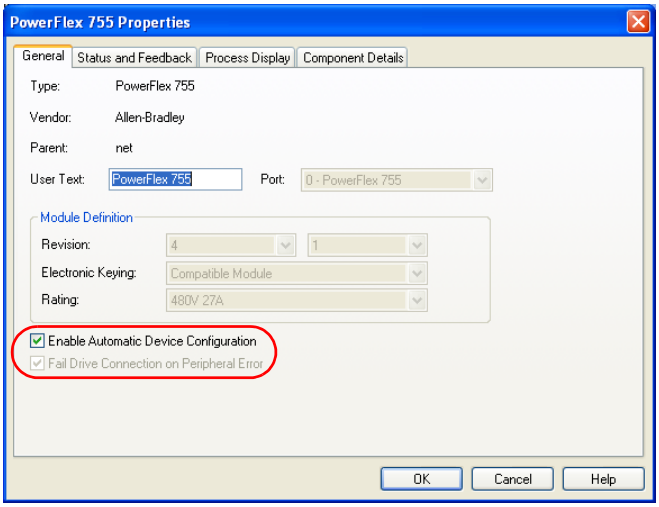
Electronic Keying for HIMs and serial converters (1203-SSS and 1203-USB) are disabled by default. These are typically temporary devices or used for monitoring purposes only and therefore 'do not matter' if they are present or not. You still have the option to select these to other Keying selections if desired.

4. Click OK when finished.

TIP When using version 4.02 (or later) Drive AOPs, there is no need to perform step 5 through step 9. Instead, skip to step 10.

5. Click the Drive tab.

6. Click the Port Properties icon to open the Properties dialog box.



There are two checkboxes related to ADC.

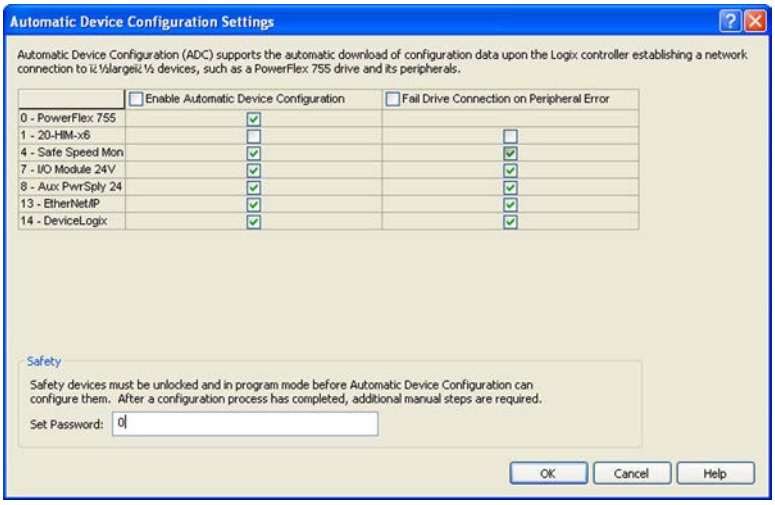
Checkbox Selection	Description
Enable Automatic Device Configuration	See the Important note on page 60 and, depending on the Drive AOP version being used, Version 4.01 Drive Add-on Profiles (AOPs) on page 60 or Version 4.02 (or later) Drive Add-on Profiles (AOPs) on page 61 for additional information about ADC use and Logix behavior. ADC is disabled when unchecked, or enabled when checked.
Fail Drive Connection on Peripheral Error	This selection is only available for peripherals. If you want to ensure that the correct peripheral is present with the correct configuration before the controller connects to the drive, check this box. If the peripheral is not essential to your use of the drive (for example, a HIM that may or may not be present all the time), uncheck this box. Note that when a failure occurs, RSLogix software will show both a configuration on Port 0 (drive) and Port 'xx' (peripheral) error.

7. When finished, click OK.
8. Perform all previous steps for each peripheral in the treeview on the Drive tab.
   a. Select the peripheral in the treeview.
   b. Click the Port Properties icon to open the Properties dialog box.
9. When finished configuring the drive and peripherals, click OK to close the Module Properties dialog box for the drive.

   TIP When using version 4.01 Drive AOPs, skip to step 13.

10. Click the Drive tab.

11. Click the ADC icon to open the ADC Settings dialog box.


Automatic Device Configuration Settings
Automatic Device Configuration (ADC) supports the automatic download of configuration data upon the Logix controller establishing a network connection to it's/largeit's devices, such as a PowerFlex 755 drive and its peripherals.
Enable Automatic Device Configuration
Fail Drive Connection on Peripheral Error
0 - PowerFlex 755
1 - 20-HIM-x6
4 - Safe Speed Mon
7 - I/O Module 24V
8 - Aux PwrSply 24
13 - EtherNet/IP
14 - DeviceLogix
Safety
Safety devices must be unlocked and in program mode before Automatic Device Configuration can configure them. After a configuration process has completed, additional manual steps are required.
Set Password:
OK
Cancel
Help

The ADC Settings dialog box provides a single location for ADC configuration of the drive's ports. Global checkboxes at the top of each column checks or unchecks the entire column. Ports can also be turned on/off individually. See the checkbox selection information in step 6 for additional details.

The Safety section in the lower part of the ADC Settings dialog box will only be displayed if a Safe Speed Monitor Module is present.

12. Click OK when finished.

13. Perform all previous steps for each additional PowerFlex 750-Series drive.

14. Save your RSLogix 5000 project and download the project to the Logix controller.

IMPORTANT Note that some parameters can affect the minimum/maximum of other parameters and can cause the settings of these parameters to be 'out of range'. This, in turn, will cause ADC to fail with a module fault (code 16#0010) 'Mode or state of module does not allow object to perform requested service'.

For example, drive Parameters 520 - [Max Fwd Speed] and 521 - [Max Rev Speed] affect the minimum/maximum of the following drive parameters:

- 329 - [Alternate Manual Reference Analog High]
- 547 - [Speed Reference A Analog High]
- 552 - [Speed Reference B Analog High]
- 564 - [Digital Input Manual Reference Analog High]
- 571…577 - [Preset Speed 1…7]
- 602 - [Trim Reference A Analog High]
- 606 - [Trim Reference B Analog High]

Setting drive Parameter 520 or 521 to a lower value could cause the settings in the above parameters to become 'out of range'. If you adjust Parameter 520 or 521, check the above parameters and make any necessary updates to ensure they are 'in range'.

NOTE: It is recommended to review all parameters needed for your application to verify that they are 'in range'. When using version 4.02 (or later) Drive AOPs, a yellow highlight and text notification in the Parameters Linear List editor appears to identify out of range parameters.

ATTENTION: If you manually download any configuration changes to the drive, the next time the Logix controller establishes an I/O connection with the drive will still trigger an ADC download. This synchronizes the configuration signatures in the controller and drive, and prevents future ADC downloads from occurring unless a configuration change was made.

ADC and Logix Memory

Starting in RSLogix 5000 software, version 16.00, drive configuration settings have been stored in the project's ACD file which is downloaded and stored in the controller. Configuration settings for ADC-capable devices contain additional port and scripting information to choreograph the download process, so additional Logix memory is used compared with PowerFlex 750-Series drives in RSLogix 5000 software, version 16.00...19.00 systems. Note these examples of memory usage:

- A PowerFlex 755 drive with no option modules, minimal parameters changed from defaults, and no DeviceLogix program consumes approximately 8.5 kilobytes of Logix memory per drive.

- A PowerFlex 755 drive with four option modules, approximately 50 changed parameters, and a 32-block DeviceLogix program consumes approximately 25 kilobytes of Logix memory per drive.

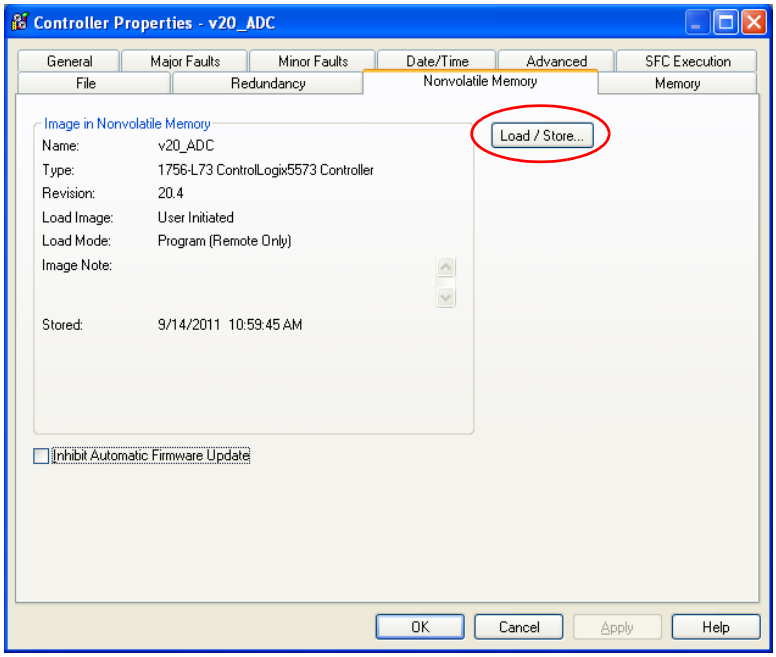
The majority of Logix controllers have megabytes of memory available, so this typically should not be an issue. You can monitor Logix memory usage in RSLogix 5000 software. From the Controller Properties dialog box, click the Memory tab.

Store the Drive's and Peripherals' Firmware in the Logix Controller (Firmware Supervisor)

The Logix Firmware Supervisor function has been extended to provide firmware updates for the peripherals connected to the drive. You must be online and in program mode with the controller to load/store the firmware supervisor settings. To configure the controller to check and refresh the correct firmware for the drive and peripherals, perform the following steps.

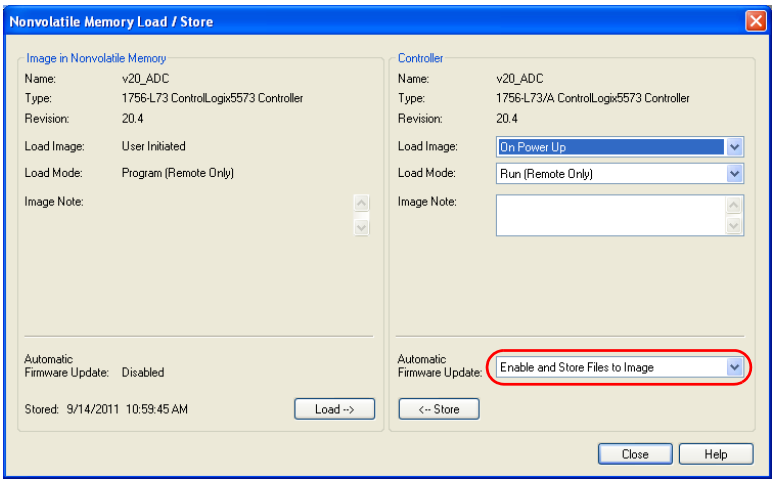
1. Verify that 'Exact Match' keying is selected in the drive's and peripherals' properties dialog boxes.
   a. Click the General tab to view the drive's keying.
   b. Right-click each peripheral on the Drive tab and choose Properties to view the peripheral's keying.
2. Verify that ControlFLASH firmware kits for each revision of firmware for each device that should be stored in the controller have been installed on the computer running RSLogix 5000 software.
3. Verify that a CompactFlash or other storage card has been installed in the controller.
4. Use RSLogix 5000 software to go online with the controller in Program mode.
5. Download your program if you have not done so already.
6. In the treeview, right-click the controller folder at the top of the Controller Organizer and choose Properties.

7. On the Controller Properties dialog box, click the Nonvolatile Memory tab.



8. Click Load/Store.

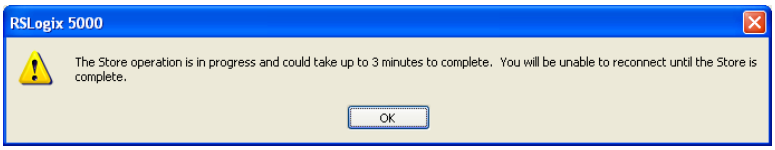
   The Nonvolatile Memory Load/Store dialog box appears.



9. From the Automatic Firmware Update pull-down menu, choose Enable and Store Files to Image.
10. Click <-- Store.

    You may see two different continue confirmation dialog boxes relating to communication disruptions and erasure of the current contents of the storage card. If okay, click Yes on either dialog box.

11. RSLogix 5000 software will go to the Offline state, and the following dialog box will appear.


RSLogix 5000
The Store operation is in progress and could take up to 3 minutes to complete. You will be unable to reconnect until the Store is complete.
OK

    Wait a short period of time for the store operation to complete, and then attempt to go online with the controller again.

Special Considerations When Using a DeviceLogix Program

There are special considerations when a PowerFlex 750-Series drive has ADC enabled and is running a DeviceLogix program. ADC will download the DeviceLogix program after the drive is replaced but, by default, the program will be disabled (not running) since the factory default setting is 'Logic disabled' for a new replacement drive.

If you want the DeviceLogix program to be enabled (run) after ADC, you have to configure the drive in your project to do this by performing the following steps.

1. Select the PowerFlex 750-Series drive and click the Drive tab.
2. Select the DeviceLogix Port in the device tree.
3. Click the DeviceLogix icon to open the DeviceLogix Editor.
4. From the Edit menu, choose Recovery Mode.
5. Click Enabled to enable DeviceLogix after ADC.

If you do not set up the automatic method described above to enable DeviceLogix after ADC, you can still do so manually. To enable the DeviceLogix program, set DeviceLogix Parameter 53 - [DLX Operation] to '0' (Enable Logic), by using one of these methods:

- An explicit message in the Logix program to write to the parameter.
- A HIM or drive software tool to set the parameter.

Note that after setting DeviceLogix Parameter 53 to '0' (Enable Logic), the value will be changed by the drive to '6' (Logic Enabled) to indicate operation status.

IMPORTANT Do not set DeviceLogix parameter 53 - [DLX Operation] to '0' (Enable Logic) in the Add-on Profile configuration before saving the configuration to the controller. This setting would lock the module and prevent writing the higher numbered parameters, thus causing the ADC download to fail.

Special Considerations When Using a 20-750-S1 Safe Speed Monitor Module

There are special considerations when using ADC with the 20-750-S1 Safe Speed Monitor Module. Safety requires manual intervention by the user before the drive can become operational. Although a manual 'step' is required, ADC can still be used.

IMPORTANT Firmware Supervisor cannot be used to update the 20-750-S1 Safe Speed Monitor Module firmware. This is due to unique upgrade components with its safety core. It can be manually upgraded using ControlFLASH, a 1203-USB Serial Converter, and the appropriate upgrade file.

In addition to the configuration of the Safe Speed Monitor Module, the password for the Module is stored in the configuration script in the controller and used as part of the connection process to allow the configuration stored in the controller to be downloaded to the Module. This password will need to be entered into the profile for the Safe Speed Monitor Module in the drive's Module Properties dialog box in RSLogix 5000 software. This password value is the value entered in parameter 13 of the Safe Speed Monitor Module on controller download to the Module, which is required by procedure to be recorded by the user for future use when interacting with the Module. When using this password in the future, it would be entered into parameter 1 for the Safe Speed Monitor Module to allow either locking via parameter 5 or password changing via parameters 13 and 17.

IMPORTANT Do not set Safe Speed Monitor Module parameter 5 [Lock State] to '1' (Lock); or parameter 6 [Operating Mode] to '1' (Run) in the Add-on Profile configuration before saving the configuration to the controller. Setting these parameters would lock the Module and prevent writing the higher numbered parameters, thus causing the ADC download to fail. These two parameters need to be changed manually after performing an upload or after the ADC download.

The following manual steps may be needed to take an existing configured Safe Speed Monitor Module (for example, replacing the drive and reusing the existing Module) out of Run mode to allow the controller to download the configuration to the Safe Speed Monitor Module. (Note that these manual steps may need to be performed with the Ethernet cable disconnected from the drive as the controller's attempts to configure the Safe Speed Monitor Module will include locking out writes from other sources, such as the HIM).

1. Inhibit the drive's connection—or disconnect the communication card through which the controller is trying to configure the Safe Speed Monitor Module using ADC.
2. Set Safe Speed Monitor Module parameter 1 [Password] to the Module's current password.
3. Set Safe Speed Monitor Module parameter 5 [Lock State] to '0' (Unlock).
4. Set Safe Speed Monitor Module parameter 6 [Operating Mode] to '0' (Program).
5. If the Safe Speed Monitor Module's current password is not '0', change the password of the Module to '0'.
6. Set Safe Speed Monitor Module parameter 1 [Password] to the Module's current password.
7. Set Safe Speed Monitor Module parameter 13 [New Password] to '0'.
8. Set Safe Speed Monitor Module parameter 17 [Password Command] to '1' (Change PW).
9. Uninhibit the connection or reconnect the cable.

   The controller can download the new configuration, including the new password.

The following manual steps are required to put the Safe Speed Monitor Module into Run mode, generate a configuration signature, and lock the configuration. These steps also need to be performed when replacing the Safe Speed Monitor Module with a new, 'out of the box' unit.

1. Set Safe Speed Monitor Module parameter 6 [Operating Mode] to '1' (Run).

   A configuration signature is generated.
2. Access Safe Speed Monitor Module parameter 10 [Signature ID] and record the configuration signature value stored in this parameter.
3. Enter the current password for the Safe Speed Monitor Module into parameter 1 [Password].
4. Set Safe Speed Monitor Module parameter 5 [Lock State] to '1' (Lock).

These steps can be performed with a HIM, drive software configuration tool, or via an HMI that can trigger explicit message writes from the controller program. To meet SIL CL3, PLe, or Cat 4 requirements, the user must verify that the correct configuration is locked in the Safe Speed Monitor Module. See the drive and Safe Speed Monitor Module documentation for more information.

Monitoring ADC Progress

The time it takes for the connection process to complete will vary from seconds to several minutes depending on several factors:

- The number of peripherals enabled for ADC.

- If a configuration signature for the drive/peripheral indicates a configuration download needs to be performed for the given port.
- Whether Firmware Supervisor is enabled and needs to upgrade the drive and/or any peripherals prior to ADC taking place. Note that updating drives or peripherals will add significantly to the connection process time and will be similar to the time it takes to manually update using ControlFLASH software.
- If a 20-750-S1 Safe Speed Monitor option module, which requires a manual 'step' in its configuration process, is used.
- If a DeviceLogix program (Port 14) is used.

IMPORTANT ADC can automatically reset the drive as part of the configuration process. This is done because some parameters require a reset before they take effect. If a drive is being replaced with an out-of-the-box drive, you will typically see at least two resets during the ADC process—one for the parameters in the drive (Port 0) and, for a PowerFlex 755 drive, one for the parameters in the embedded EtherNet/IP adapter (Port 13).

See the PowerFlex 750-Series AC Drive Programming Manual, publication 750-PM001, for information about the drive status indicators. An operational drive in a running Logix system will have the following status indicator states.

Status Indicator	Color	State	Description
STS	Green	Flashing	Drive ready but not running, and no faults are present.
		Steady	Drive running, no faults are present.
ENET	Green	Steady	Embedded ENET adapter is properly connected and communicating on the network.
LINK	Green	Flashing	Embedded ENET adapter is properly connected and transmitting data packets on the network.

Additional information may also be displayed on the HIM if it is present (upgrade status, and so forth).

If ADC is unsuccessful, the ENET status indicator will be flashing green or off, and RSLogix 5000 software can be used to get additional information. When online, the drive at issue should have a yellow triangle ⚠ next to it in the RSLogix 5000 project's I/O Configuration folder. Double-click the drive to open the Drive AOP. The Connection tab will show a Module Fault code and the Drive tab will identify issues to the Port level.

ADC Status Field	Description
Running	Any desired configuration is complete, and the I/O connection is running.
Configuring	ADC is currently updating the configuration of the drive or one of its peripherals. Clicking the Connection tab will show which device is being updated.
Firmware Updating	ADC is currently updating the firmware of the drive or one of its peripherals. Clicking the Drive tab will show which device is being updated.

ADC Status Field	Description
Inhibited	The program has the connection inhibited. You can uninhibit the connection on the Connection tab.
Faulted	A problem is preventing the controller from connecting to the drive (for example, the device at the IP address provided is not a PowerFlex 750-Series drive). Clicking the Connection tab will show the cause (Module Fault). Clicking the Drive tab may also show the faulted ports.

Examples of potential issues/solutions are shown in the following table.

Issue	Solution
'Compatible module' keying selected, but replacement drive or peripheral has an earlier firmware revision than the failed device.	Replace device with a revision that is later than or equal to the failed device. If necessary, use ControlFLASH software to upgrade the replacement device first to an acceptable revision level.
Peripheral is required for connection ('Fail Drive Connection on Peripheral Error' was checked), but it is missing.	Add required peripheral or remove peripheral from RSLogix 5000 project for the drive and download project to the controller.
A Safe Speed Monitor Module is used.	A manual 'step' is required to enter the safety password and validate the system. See the section Special Considerations When Using a 20-750-S1 Safe Speed Monitor Module on page 70 for additional information.
Parameter 'out of range' error—ADC wrote a value to a parameter that was out of range (typically would only occur during initial commissioning of a drive system).	Use any available drive software tool to view a linear list of changed parameters to see if the configured value is outside the minimum/maximum value. Version 4.02 (or later) Drive AOPs are the preferred tool and will highlight any out of range parameter in the Linear List editor.

Using the RSLogix 5000 Generic Profile, All Versions

We recommend that you only use the basic RSLogix 5000 software Generic Profile for any of the following reasons:

- A specific drive profile in other versions of RSLogix 5000 software is unavailable.
- Users are already familiar with a Generic Profile and do not want to convert an existing project to a drive Add-on Profile (RSLogix 5000 software, version 16.00 or later).
- A project must maintain specific revision level control.
- The controller cannot be taken offline. RSLogix 5000 software, version 16.00 or later, enables the drive Generic Profile to be added while the controller is online and in the Run mode.

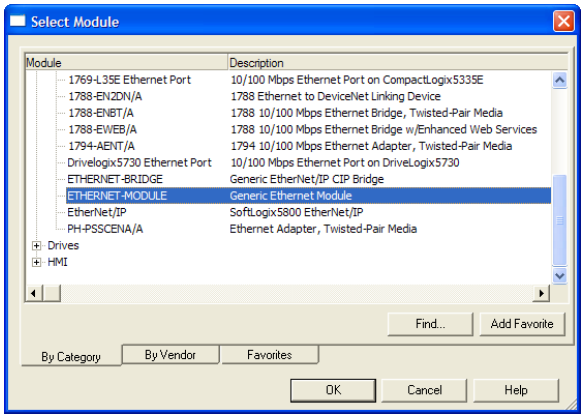
Add the Drive/Adapter to the I/O Configuration

To transmit data between the bridge and the drive, you must add the drive as a child device to the parent bridge.

1. In the treeview, right-click on the bridge and choose New Module to display the Select Module dialog box.

   In our example, we right-click on the 1756-ENBT/A bridge.

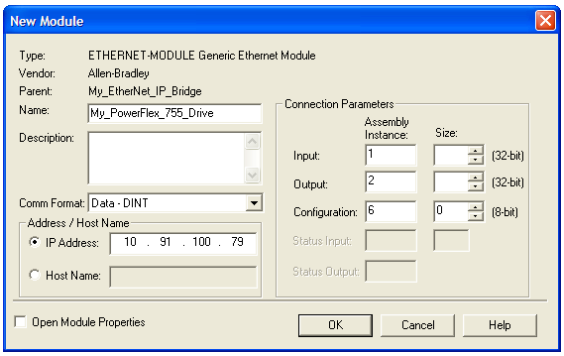
2. Expand the Communications group to display all of the available communication modules.



3. Select 'ETHERNET-MODULE' from the list to configure the drive and its embedded EtherNet/IP adapter.

4. Click OK.

   The drive's New Module dialog box appears.



5. Edit the following information about the drive and adapter.

Box	Setting
Name	A name to identify the drive and adapter.
Description	Optional – description of the drive/adapter.
Comm Format	**Data - DINT** (This setting formats the data in 32-bit words.)
IP Address	The IP address of the adapter.
Open Module Properties	When this box is checked, clicking OK opens additional module properties dialog boxes to further configure the drive/adapter. When unchecked, clicking OK closes the drive's New Module dialog box. For this example, check this box.

6. Under Connection Parameters, edit the following information.

Box	Assembly Instance	Size
Input	**1** (This value is required.)	The value will vary based on the number of **[DL From Net xx]** parameters used for your application (see details below).
Output	**2** (This value is required.)	The value will vary based on the number of **[DL To Net xx]** parameters used for your application (see details below).
Configuration	**6** (This value is required.)	**0** (This value is required.)

Enter the number of 32-bit words that are required for your I/O in the Input Size and Output Size boxes. Because the adapter always uses the 32-bit Logic Status, 32-bit Feedback, and a 32-bit word dedicated for memory allocation of the Generic Ethernet module profile, at least three 32-bit words must be set for the Input Size. The adapter also uses the 32-bit Logic Command and 32-bit Reference, requiring at least two 32-bit words for the Output Size. If any or all of the drive's sixteen 32-bit Datalinks are used (see Setting a Master-Slave Hierarchy on page 32 or Custom Peer I/O Configuration on page 36), the Input and Output Size settings must be increased accordingly.

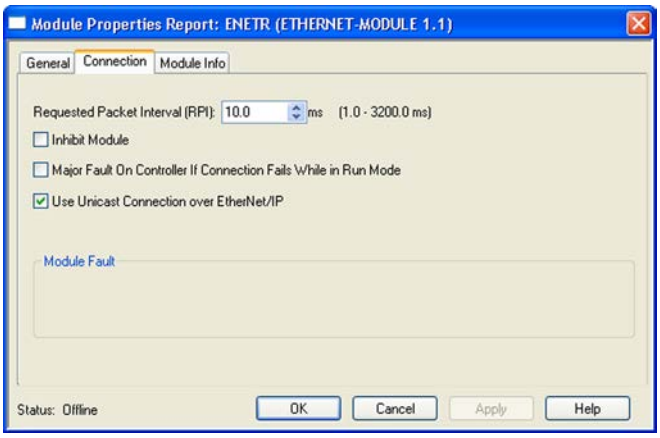
- **Input Size:** Start with 3 words and add 1 word for **each** Datalink used to read data. For example, if 3 Datalinks—[**DL To Net xx**] parameters—will be used to read drive or peripheral parameters, add 3 words to the required 3 words for a total of 6 words. You can use adapter **Parameter 35 - [DLs To Net Act]** to check the total number of Datalinks being used. Word 0 is a pad word, Word 1 is Logic Status, Word 2 is Speed Feedback, Word 3 is DL To Net 01, and so forth (see Figure 9).
- **Output Size:** Start with 2 words and add 1 word for **each** Datalink used to write data. For example, if 7 Datalinks—[**DL From Net xx**] parameters—will be used to write to drive or peripheral parameters, add 7 words to the required 2 words for a total of 9 words. You can use adapter **Parameter 34 - [DLs From Net Act]** to check the total number of Datalinks being used. Word 0 is Logic Command, Word 1 is Speed Reference, Word 2 is DL From Net 01, and so forth (see Figure 10).

For the example in this manual, all 16 [**DL From Net xx**] and all 16 [**DL To Net xx**] are used, resulting in an Input Size of '19' and an Output Size of '18'.

7. After setting the information in the drive's New Module dialog box, click OK.

The Module Properties dialog box appears.

8. Click the Connection tab.



9. In the 'Requested Packet Interval (RPI)' box, set the value to 2.0 milliseconds or greater (default is 20.0 milliseconds).

   This value determines the maximum interval that a controller should use to move data to and from the adapter. To conserve bandwidth, use higher values for communicating with low priority devices.

   The 'Inhibit Module' box, when checked, inhibits the adapter from communicating with the RSLogix 5000 project. When the 'Major Fault On' box is checked, a major controller fault will occur when the adapter's connection fails while the controller is in the Run mode. For this example, leave the 'Inhibit Module' and 'Major Fault On' boxes unchecked.

   Unicast support has been added to RSLogix 5000 software, version 18.00 (or later). Unicast is recommended whenever possible. For the benefits of unicast operation, see Preparing for an Installation on page 17.

10. Click OK.

    The new node ('My_PowerFlex_755_Drive' in this example) now appears under the bridge ('My_EtherNet_IP_Bridge' in this example) in the I/O Configuration folder. If you double-click on the Input and Output Controller Tags (Figure 9 and Figure 10), you will see that module-defined data types and tags have been automatically created. After you save and download the configuration, these tags allow you to access the Input and Output data of the drive via the controller's ladder logic.

Figure 9 - Input Image Controller Tags

Name	Data Type	Description
My_PowerFlex_755_Drive:I	AB:ETHERNET...	
My_PowerFlex_755_Drive:I.Data	DINT[19]	
My_PowerFlex_755_Drive:I.Data[0]	DINT	Pad Word
My_PowerFlex_755_Drive:I.Data[1]	DINT	Logic Status
My_PowerFlex_755_Drive:I.Data[2]	DINT	Speed Feedback
My_PowerFlex_755_Drive:I.Data[3]	DINT	DL To Net 01
My_PowerFlex_755_Drive:I.Data[4]	DINT	DL To Net 02
My_PowerFlex_755_Drive:I.Data[5]	DINT	DL To Net 03
My_PowerFlex_755_Drive:I.Data[6]	DINT	DL To Net 04
My_PowerFlex_755_Drive:I.Data[7]	DINT	DL To Net 05
My_PowerFlex_755_Drive:I.Data[8]	DINT	DL To Net 06
My_PowerFlex_755_Drive:I.Data[9]	DINT	DL To Net 07
My_PowerFlex_755_Drive:I.Data[10]	DINT	DL To Net 08
My_PowerFlex_755_Drive:I.Data[11]	DINT	DL To Net 09
My_PowerFlex_755_Drive:I.Data[12]	DINT	DL To Net 10
My_PowerFlex_755_Drive:I.Data[13]	DINT	DL To Net 11
My_PowerFlex_755_Drive:I.Data[14]	DINT	DL To Net 12
My_PowerFlex_755_Drive:I.Data[15]	DINT	DL To Net 13
My_PowerFlex_755_Drive:I.Data[16]	DINT	DL To Net 14
My_PowerFlex_755_Drive:I.Data[17]	DINT	DL To Net 15
My_PowerFlex_755_Drive:I.Data[18]	DINT	DL To Net 16

Figure 10 - Output Image Controller Tags

Name	Data Type	Description
My_PowerFlex_755_Drive:O	AB:ETHERNET...	
My_PowerFlex_755_Drive:O.Data	DINT[18]	
My_PowerFlex_755_Drive:O.Data[0]	DINT	Logic Command
My_PowerFlex_755_Drive:O.Data[1]	DINT	Speed Reference
My_PowerFlex_755_Drive:O.Data[2]	DINT	DL From Net 01
My_PowerFlex_755_Drive:O.Data[3]	DINT	DL From Net 02
My_PowerFlex_755_Drive:O.Data[4]	DINT	DL From Net 03
My_PowerFlex_755_Drive:O.Data[5]	DINT	DL From Net 04
My_PowerFlex_755_Drive:O.Data[6]	DINT	DL From Net 05
My_PowerFlex_755_Drive:O.Data[7]	DINT	DL From Net 06
My_PowerFlex_755_Drive:O.Data[8]	DINT	DL From Net 07
My_PowerFlex_755_Drive:O.Data[9]	DINT	DL From Net 08
My_PowerFlex_755_Drive:O.Data[10]	DINT	DL From Net 09
My_PowerFlex_755_Drive:O.Data[11]	DINT	DL From Net 10
My_PowerFlex_755_Drive:O.Data[12]	DINT	DL From Net 11
My_PowerFlex_755_Drive:O.Data[13]	DINT	DL From Net 12
My_PowerFlex_755_Drive:O.Data[14]	DINT	DL From Net 13
My_PowerFlex_755_Drive:O.Data[15]	DINT	DL From Net 14
My_PowerFlex_755_Drive:O.Data[16]	DINT	DL From Net 15
My_PowerFlex_755_Drive:O.Data[17]	DINT	DL From Net 16

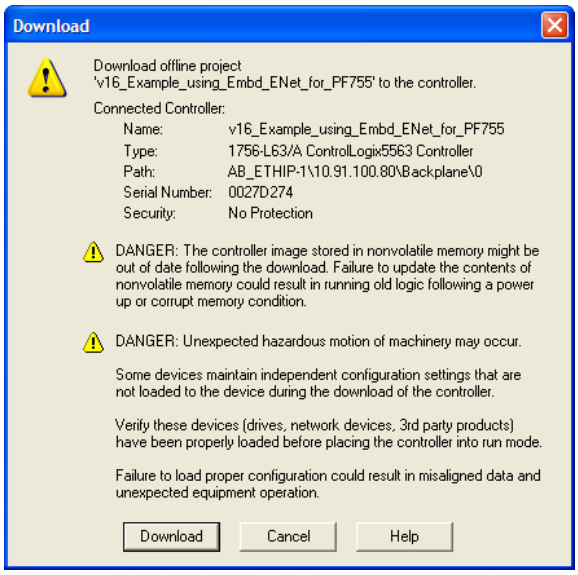
Save the I/O Configuration to the Controller

After adding the bridge and drive/adapter to the I/O configuration, you must download the configuration to the controller. You should also save the configuration to a file on your computer.

TIP When using RSLogix 5000 software, version 16.00 or later, you can add the I/O configuration of a Generic Profile while the controller is online and in the Run mode.

1. From the Communications menu in the RSLogix 5000 dialog box, choose Download.

   The Download dialog box appears.


Download
Download offline project
'v16_Example_using_Embd_ENet_for_PF755' to the controller.
Connected Controller:
Name: v16_Example_using_Embd_ENet_for_PF755
Type: 1756-L63/A ControlLogix5563 Controller
Path: AB_ETHIP-1\10.91.100.80\Backplane\0
Serial Number: 0027D274
Security: No Protection
DANGER: The controller image stored in nonvolatile memory might be out of date following the download. Failure to update the contents of nonvolatile memory could result in running old logic following a power up or corrupt memory condition.
DANGER: Unexpected hazardous motion of machinery may occur.
Some devices maintain independent configuration settings that are not loaded to the device during the download of the controller.
Verify these devices (drives, network devices, 3rd party products) have been properly loaded before placing the controller into run mode.
Failure to load proper configuration could result in misaligned data and unexpected equipment operation.
Download
Cancel
Help

   TIP If a message box reports that RSLogix 5000 software is unable to go online, find your controller in the Who Active dialog box. From the Communications menu, choose Who Active. After finding and selecting the controller, click Set Project Path to establish the path. If your controller does not appear, you need to add or configure the EtherNet/IP driver with RSLinx software. See Using RSLinx Classic on page 45 and RSLinx online help for details.

2. Click Download to download the configuration to the controller.

   When the download is successfully completed, RSLogix 5000 software goes into the Online mode and the I/O OK box in the upper-left of the dialog box should be steady green.

3. From the File menu, choose Save.

   If this is the first time you saved the project, the Save As dialog box appears.

   a. Navigate to a folder.

   b. Type a file name.

   c. Click Save to save the configuration as a file on your computer.

4. Configure any Datalinks in the drive that were enabled in the controller and adapter during I/O configuration.

   Each Datalink being used must be assigned to a specific parameter in the drive or connected peripheral (see Setting a Master-Slave Hierarchy on page 32 or Custom Peer I/O Configuration on page 36). If this is not done, the controller will receive or send placeholder data instead of actual drive or peripheral parameter values.

5. Place the controller in Remote Run or Run Mode.

Using the I/O

This chapter provides information and examples that explain how to control, configure, and monitor a PowerFlex 755 drive using the configured I/O.

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ATTENTION: Risk of injury or equipment damage exists. The examples in this publication are intended solely for purposes of example. There are many variables and requirements with any application. Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication.

About I/O Messaging

On CIP-based networks, including EtherNet/IP, I/O connections are used to transfer the data which controls the PowerFlex drive and sets its Reference. I/O can also be used to transfer data to and from Datalinks in PowerFlex 750-Series drives.

The adapter includes the Logic Command, Logic Status, Reference, Feedback, and memory allocation for the Generic Ethernet module profile (all as 32-bit words) in the controller's I/O image. This basic I/O must always be configured in the EtherNet bridge using RSLogix 5000 software. Additional I/O, if needed, can be set using up to 16 Datalinks to write data and/or up to 16 Datalinks to read data. When using any combination of these Datalinks, add one 32-bit word for **each** Datalink to the basic I/O Input Size and/or Output Size.

Chapter 3, Configuring the Adapter, and Chapter 4, Configuring the I/O, discuss how to configure the adapter and controller on the network for the required I/O. The Glossary defines the different options. This chapter discusses how to use I/O after you have configured the adapter and controller.

Understanding the ControlLogix Controller I/O Image

The terms 'input' and 'output' are defined from the controller's point of view. Therefore, output I/O is data that is produced by the controller and consumed by the adapter. Input I/O is status data that is produced by the adapter and consumed as input by the controller. The I/O image will vary based on the following:

- How many of the drive's 32-bit Datalinks (**DL From Net 01-16** and **DL To Net 01-16**) are used.
- **ControlLogix/CompactLogix Controllers only**—The drive profile used in RSLogix 5000 software (drive Add-on Profile in version 16.00 or later, or Generic Profile in all versions).

Since the drive Add-on Profile in RSLogix 5000 software, version 16.00 or later, provides descriptive controller tags, the I/O image (tag size and location) is automatically configured based on the drive being used. When using the RSLogix 5000 Generic Profile, however, controller tags are not descriptive or defined.

Table 2 shows the I/O image when using all of the 32-bit Datalinks.

Table 2 - ControlLogix I/O Image for PowerFlex 750-Series Drives (32-bit Logic Command/Status, Reference/Feedback, and Datalinks)

DINT	Output I/O
0	Logic Command
1	Reference
2	DL From Net 01
3	DL From Net 02
4	DL From Net 03
5	DL From Net 04
6	DL From Net 05
7	DL From Net 06
8	DL From Net 07
9	DL From Net 08
10	DL From Net 09
11	DL From Net 10
12	DL From Net 11
13	DL From Net 12
14	DL From Net 13
15	DL From Net 14
16	DL From Net 15
17	DL From Net 16

Input I/O Using…			
DINT	Drive Add-on Profile	DINT	Generic Profile
0	Logic Status	0	Padword
1	Feedback	1	Logic Status
2	DL To Net 01	2	Feedback
3	DL To Net 02	3	DL To Net 01
4	DL To Net 03	4	DL To Net 02
5	DL To Net 04	5	DL To Net 03
6	DL To Net 05	6	DL To Net 04
7	DL To Net 06	7	DL To Net 05
8	DL To Net 07	8	DL To Net 06
9	DL To Net 08	9	DL To Net 07
10	DL To Net 09	10	DL To Net 08
11	DL To Net 10	11	DL To Net 09
12	DL To Net 11	12	DL To Net 10
13	DL To Net 12	13	DL To Net 11
14	DL To Net 13	14	DL To Net 12
15	DL To Net 14	15	DL To Net 13
16	DL To Net 15	16	DL To Net 14
17	DL To Net 16	17	DL To Net 15
		18	DL To Net 16

Using Logic Command/Status

The Logic Command is a 32-bit word of control data produced by the controller and consumed by the adapter. The Logic Status is a 32-bit word of status data produced by the adapter and consumed by the controller.

When using a ControlLogix controller, the Logic Command word is always DINT 0 in the output image and the Logic Status word is always:

- DINT 0 in the input image when using the drive Add-on Profile.
- DINT 1 in the input image when using the Generic Profile.

This manual contains the bit definitions for compatible products available at the time of publication in Appendix D, Logic Command/Status Words: PowerFlex 750-Series Drives.

Using Reference/Feedback

The Reference is a 32-bit REAL (floating point) word of control data produced by the controller and consumed by the adapter. The Feedback is a 32-bit REAL (floating point) word of status data produced by the adapter and consumed by the controller.

When using a ControlLogix controller, the 32-bit REAL Reference word is always DINT 1 in the output image (see Table 2) and the 32-bit REAL Feedback word is always:

- DINT 1 in the input image when using the drive Add-on Profile.
- DINT 2 in the input image when using the Generic Profile.

When using a drive Add-on Profile, the Reference and Feedback are automatically formatted properly and displayed as a controller tag. When using the Generic Profile, the I/O image is integer-based and the Reference and Feedback are floating point. Because of this, a COP (Copy) instruction or User Defined Data Type (UDDT) is required to correctly write values to the Reference and read values from the Feedback. See the ladder logic program examples in Figure 16 and Figure 17.

TIP When using the drive Add-on Profile, the controller tags for Reference and Feedback are automatically and properly formatted. This eliminates the need for data conversion using COP (copy) instructions or a UDDT to copy the DINT data into a REAL word.

The Reference and Feedback 32-bit REAL values represent drive speed. The scaling for the speed Reference and Feedback is dependent on drive Parameter 300 - [Speed Units]. For example, if Parameter 300 is set to Hz, a 32-bit REAL Reference value of '30.0' would equal a Reference of 30.0 Hz. If Parameter 300 is set to RPM, a 32-bit REAL Reference value of '1020.5' would equal a Reference of 1020.5 RPM. Note that the commanded maximum speed can never exceed the value of drive Parameter 520 - [Max Fwd Speed]. Table 3 shows example References and their results for a PowerFlex 750-Series drive that has its:

- Parameter 300 - [Speed Units] set to Hz.
- Parameter 37 - [Maximum Freq] set to 130 Hz.
- Parameter 520 - [Max Fwd Speed] set to 60 Hz.

When Parameter 300 - [Speed Units] is set to RPM, the other parameters are also in RPM.

Table 3 - PowerFlex 750-Series Drive Example Speed Reference/Feedback Scaling

Network Reference Value	Speed Command Value (2)	Output Speed	Network Feedback Value
130.0	130 Hz	60 Hz (3)	60.0
65.0	65 Hz	60 Hz (3)	60.0
32.5	32.5 Hz	32.5 Hz	32.5
0.0	0 Hz	0 Hz	0.0
-32.5 (1)	32.5 Hz	32.5 Hz	32.5

(1) The effects of values less than 0.0 depend on whether the PowerFlex 750-Series drive uses a bipolar or unipolar direction mode. See the drive documentation for details.

(2) For this example, drive Parameter 300 - [Speed Units] is set to Hz.

(3) The drive runs at 60 Hz instead of 130 Hz or 65 Hz because drive Parameter 520 - [Max Fwd Speed] sets 60 Hz as the maximum speed.

Using Datalinks

A Datalink is a mechanism used by PowerFlex drives to transfer data to and from the controller. Datalinks allow a drive parameter value to be read or written to without using an Explicit Message. When enabled, each Datalink occupies one 32-bit word in a ControlLogix controller.

The following rules apply when using PowerFlex 750-Series drive Datalinks:

- The target of a Datalink can be any Host parameter, including those of a peripheral. For example, drive parameter 535 - [Accel Time 1] can be the target of the embedded EtherNet/IP adapter and any or all option modules installed in the drive.
- The data passed through the drive's Datalink mechanism is determined by the settings of adapter **Parameters 01…16 - [DL From Net 01-16]** and **Parameters 17…32 - [DL To Net 01-16]**.

  IMPORTANT A reset is always required after configuring Datalinks so that the changes take effect.

- When an I/O connection that includes Datalinks is active, those Datalinks being used are locked and cannot be changed until that I/O connection becomes idle or inactive.
- When you use a Datalink to change a value, the value is **not** written to the Nonvolatile Storage (NVS) memory. The value is stored in volatile memory and lost when the drive loses power. Thus, use Datalinks when you need to change a value of a parameter frequently.

Datalinks for PowerFlex 750-Series drive peripherals (the embedded EtherNet/IP adapter on PowerFlex 755 drives only, and option modules such as an encoder or a communication module) are locked when the peripheral has an I/O connection with a controller. When a controller has an I/O connection to the

drive, the drive does not allow a reset to defaults, configuration download, or anything else that could change the makeup of the I/O connection in a running system. The I/O connection with the controller must first be disabled to allow changes to the respective Datalinks.

Depending on the controller being used, the I/O connection can be disabled by doing the following:

- Inhibiting the module in RSLogix 5000 software
- Putting the controller in Program mode
- Placing the scanner in idle mode
- Disconnecting the drive from the network

DeviceLogix Datalinks are also locked while the DeviceLogix program is running. The DeviceLogix program must first be disabled to allow changes to the Datalinks. Set DeviceLogix parameter 53 - [DLX Operation] to 'DisableLogic' to disable the logic (the parameter value will then change to 'LogicDisabld').

TIP When using the drive Add-on Profile, the controller tags for Reference and Feedback to Datalinks are automatically and properly formatted.

If a Generic Profile is used, a COP (copy) instruction or a UDDT is needed—for REAL parameters, speed Reference, and speed Feedback only—to copy the DINT data into a REAL word for input data conversion. For output data conversion, a COP (Copy) instruction or UDDT is needed—for REAL parameters, speed Reference, and speed Feedback only—to copy the REAL data into a DINT word. To determine whether a parameter is a 32-bit integer (DINT) or a REAL data type, see the Data Type column in the chapter containing parameters in the PowerFlex 750-Series AC Drives Programming Manual, publication 750-PM001.

Example Ladder Logic Program Information

The example ladder logic programs in the sections of this chapter are intended for and operate PowerFlex 750-Series drives.

Functions of the Example Programs

The example programs enable you to do the following:

- Receive Logic Status information from the drive.
- Send a Logic Command to control the drive (for example, start, stop).
- Send a Reference to the drive and receive Feedback from the drive.
- Send/receive Datalink data to/from the drive.

Logic Command/Status Words

These examples use the Logic Command word and Logic Status word for PowerFlex 750-Series drives. See Appendix D, Logic Command/Status Words: PowerFlex 750-Series Drives to view details.

ControlLogix Controller Example

This section includes information when using a ControlLogix controller and an RSLogix 5000 Drive Add-on Profile or a Generic Profile.

For information on using a PLC-5, SLC 500, or MicroLogix 1100/1400 controller, see Controller Examples for EtherNet/IP Network Communications with PowerFlex 750-Series Drives, publication 750COM-AT001.

Creating Ladder Logic Using the RSLogix 5000 Drive Add-on Profiles, Version 16.00 or Later

Because the drive Add-on Profile automatically created descriptive controller tags (Figure 7) for the entire I/O image in Chapter 4, you can use these tags to directly control and monitor the drive without creating any ladder logic program. However, if you intend to use Human Machine Interface devices (for example, a PanelView graphic terminal) to operate the drive and view its status, you will need to create descriptive user-defined Program tags (Figure 11) and a ladder logic program that will pass the Controller tag data to the Program tags.

Figure 11 - ControlLogix Program Tags for Drive Add-on Profile Ladder Logic Program Example

Name	Value	Data Type
Status_Reverse	0	BOOL
Status_Ready	0	BOOL
Status_Forward	0	BOOL
Status_Faulted	0	BOOL
Status_At_Speed	0	BOOL
Status_Active	0	BOOL
Speed_Reference	0.0	REAL
Speed_Feedback	0.0	REAL
Command_Stop	0	BOOL
Command_Start	0	BOOL
Command_Jog	0	BOOL
Command_Forward_Reverse	0	BOOL
Command_Clear_Faults	0	BOOL

An example ladder logic program that uses the automatically-created descriptive Controller tags and passes their data to the user-defined Program tags is shown in Figure 12 and Figure 13. Note that the prefix for the drive Controller tags is determined by the name assigned when configuring the I/O (Chapter 4).

Figure 12 - ControlLogix Controller Example Ladder Logic Program Using a Drive Add-on Profile for Logic Status/Feedback

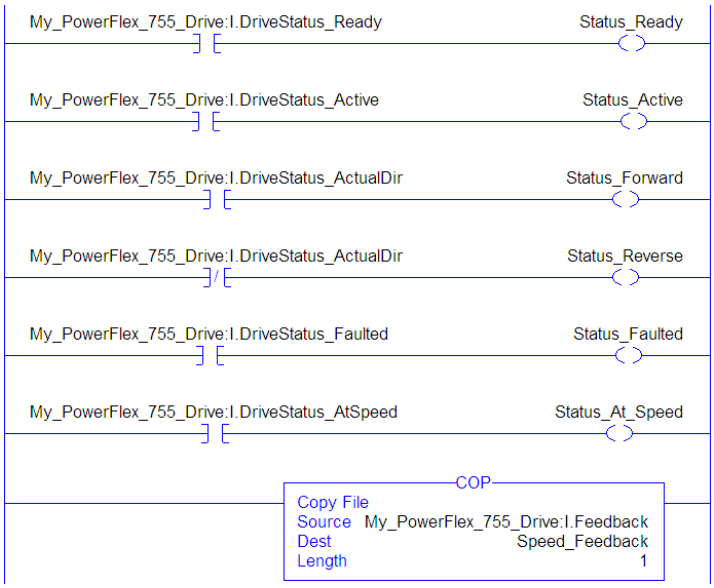
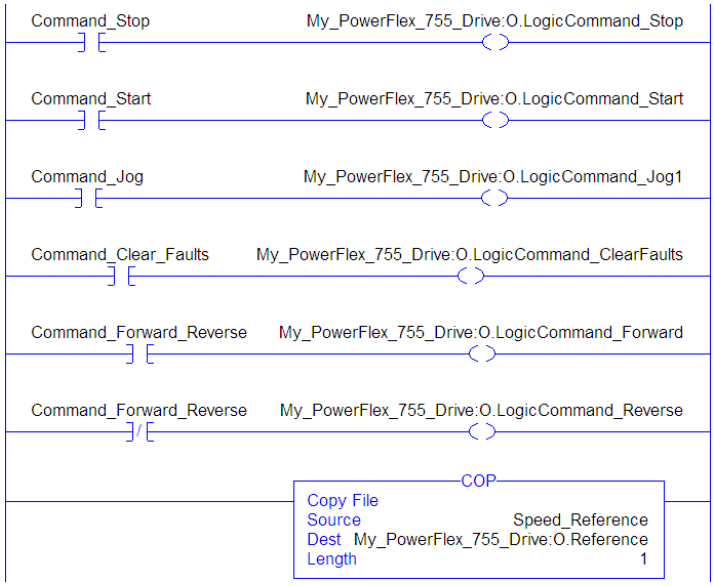


Figure 13 - ControlLogix Controller Example Ladder Logic Program Using a Drive Add-on Profile for Logic Command/Reference



Creating Ladder Logic Using the RSLogix 5000 Generic Profile, All Versions

Adapter Parameter Settings for ControlLogix Controller Example

These adapter settings were used for the example ladder logic program in this section.

Adapter Parameter	Value	Description
01 - [DL From Net 01]	370	Points to drive Par. 370 - [Stop Mode A]
02 - [DL From Net 02]	371	Points to drive Par. 371 - [Stop Mode B]
03 - [DL From Net 03]	535	Points to drive Par. 535 - [Accel Time 1]
04 - [DL From Net 04]	536	Points to drive Par. 536 - [Accel Time 2]
05 - [DL From Net 05]	537	Points to drive Par. 537 - [Decel Time 1]
06 - [DL From Net 06]	538	Points to drive Par. 538 - [Decel Time 2]
07 - [DL From Net 07]	539	Points to drive Par. 539 - [Jog Acc Dec Time]
08 - [DL From Net 08]	556	Points to drive Par. 556 - [Jog Speed 1]
09 - [DL From Net 09]	557	Points to drive Par. 557 - [Jog Speed 2]
10 - [DL From Net 10]	571	Points to drive Par. 571 - [Preset Speed 1]
11 - [DL From Net 11]	572	Points to drive Par. 572 - [Preset Speed 2]
12 - [DL From Net 12]	573	Points to drive Par. 573 - [Preset Speed 3]
13 - [DL From Net 13]	574	Points to drive Par. 574 - [Preset Speed 4]
14 - [DL From Net 14]	575	Points to drive Par. 575 - [Preset Speed 5]
15 - [DL From Net 15]	576	Points to drive Par. 576 - [Preset Speed 6]
16 - [DL From Net 16]	577	Points to drive Par. 577 - [Preset Speed 7]
17 - [DL To Net 01]	370	Points to drive Par. 370 - [Stop Mode A]
18 - [DL To Net 02]	371	Points to drive Par. 371 - [Stop Mode B]
19 - [DL To Net 03]	535	Points to drive Par. 535 - [Accel Time 1]
20 - [DL To Net 04]	536	Points to drive Par. 536 - [Accel Time 2]
21 - [DL To Net 05]	537	Points to drive Par. 537 - [Decel Time 1]
22 - [DL To Net 06]	538	Points to drive Par. 538 - [Decel Time 2]
23 - [DL To Net 07]	539	Points to drive Par. 539 - [Jog Acc Dec Time]
24 - [DL To Net 08]	556	Points to drive Par. 556 - [Jog Speed 1]
25 - [DL To Net 09]	557	Points to drive Par. 557 - [Jog Speed 2]
26 - [DL To Net 10]	571	Points to drive Par. 571 - [Preset Speed 1]
27 - [DL To Net 11]	572	Points to drive Par. 572 - [Preset Speed 2]
28 - [DL To Net 12]	573	Points to drive Par. 573 - [Preset Speed 3]
29 - [DL To Net 13]	574	Points to drive Par. 574 - [Preset Speed 4]
30 - [DL To Net 14]	575	Points to drive Par. 575 - [Preset Speed 5]
31 - [DL To Net 15]	576	Points to drive Par. 576 - [Preset Speed 6]
32 - [DL To Net 16]	577	Points to drive Par. 577 - [Preset Speed 7]

TIP The **[DL From Net xx]** parameters are inputs into the drive that come from controller outputs (for example, data to write to a drive parameter). The **[DL To Net xx]** parameters are outputs from the drive that go to controller inputs (for example, data to read a drive parameter).

Controller Tags

When you add the adapter and drive to the I/O configuration (Chapter 4), RSLogix 5000 software automatically creates generic (non-descriptive) controller tags. In this example program, the following controller tags are used.

Name	Value	Data Type	Description
+ My_PowerFlex_755_Drive:C	{...}	AB:ETHERNET...	
+ My_PowerFlex_755_Drive:I	{...}	AB:ETHERNET...	
+ My_PowerFlex_755_Drive:O	{...}	AB:ETHERNET...	

You can expand the Input and Output tags to reveal the input and output configuration. The Input tag for this example program requires nineteen 32-bit words of data (Figure 14). The Output tag for this example program requires eighteen 32-bit words of data (Figure 15).

Figure 14 - ControlLogix Controller Input Image for Drive Generic Profile Example Ladder Logic Program

Name	Data Type	Description
− My_PowerFlex_755_Drive:I	AB:ETHERNET...	
− My_PowerFlex_755_Drive:I.Data	DINT[19]	
+ My_PowerFlex_755_Drive:I.Data[0]	DINT	Pad Word
+ My_PowerFlex_755_Drive:I.Data[1]	DINT	Logic Status
+ My_PowerFlex_755_Drive:I.Data[2]	DINT	Speed Feedback
+ My_PowerFlex_755_Drive:I.Data[3]	DINT	DL To Net 01
+ My_PowerFlex_755_Drive:I.Data[4]	DINT	DL To Net 02
+ My_PowerFlex_755_Drive:I.Data[5]	DINT	DL To Net 03
+ My_PowerFlex_755_Drive:I.Data[6]	DINT	DL To Net 04
+ My_PowerFlex_755_Drive:I.Data[7]	DINT	DL To Net 05
+ My_PowerFlex_755_Drive:I.Data[8]	DINT	DL To Net 06
+ My_PowerFlex_755_Drive:I.Data[9]	DINT	DL To Net 07
+ My_PowerFlex_755_Drive:I.Data[10]	DINT	DL To Net 08
+ My_PowerFlex_755_Drive:I.Data[11]	DINT	DL To Net 09
+ My_PowerFlex_755_Drive:I.Data[12]	DINT	DL To Net 10
+ My_PowerFlex_755_Drive:I.Data[13]	DINT	DL To Net 11
+ My_PowerFlex_755_Drive:I.Data[14]	DINT	DL To Net 12
+ My_PowerFlex_755_Drive:I.Data[15]	DINT	DL To Net 13
+ My_PowerFlex_755_Drive:I.Data[16]	DINT	DL To Net 14
+ My_PowerFlex_755_Drive:I.Data[17]	DINT	DL To Net 15
+ My_PowerFlex_755_Drive:I.Data[18]	DINT	DL To Net 16

Figure 15 - ControlLogix Controller Output Image for Drive Generic Profile Example Ladder Logic Program

Name	Data Type	Description
− My_PowerFlex_755_Drive:O	AB:ETHERNET...	
− My_PowerFlex_755_Drive:O.Data	DINT[18]	
+ My_PowerFlex_755_Drive:O.Data[0]	DINT	Logic Command
+ My_PowerFlex_755_Drive:O.Data[1]	DINT	Speed Reference
+ My_PowerFlex_755_Drive:O.Data[2]	DINT	DL From Net 01
+ My_PowerFlex_755_Drive:O.Data[3]	DINT	DL From Net 02
+ My_PowerFlex_755_Drive:O.Data[4]	DINT	DL From Net 03
+ My_PowerFlex_755_Drive:O.Data[5]	DINT	DL From Net 04
+ My_PowerFlex_755_Drive:O.Data[6]	DINT	DL From Net 05
+ My_PowerFlex_755_Drive:O.Data[7]	DINT	DL From Net 06
+ My_PowerFlex_755_Drive:O.Data[8]	DINT	DL From Net 07
+ My_PowerFlex_755_Drive:O.Data[9]	DINT	DL From Net 08
+ My_PowerFlex_755_Drive:O.Data[10]	DINT	DL From Net 09
+ My_PowerFlex_755_Drive:O.Data[11]	DINT	DL From Net 10
+ My_PowerFlex_755_Drive:O.Data[12]	DINT	DL From Net 11
+ My_PowerFlex_755_Drive:O.Data[13]	DINT	DL From Net 12
+ My_PowerFlex_755_Drive:O.Data[14]	DINT	DL From Net 13
+ My_PowerFlex_755_Drive:O.Data[15]	DINT	DL From Net 14
+ My_PowerFlex_755_Drive:O.Data[16]	DINT	DL From Net 15
+ My_PowerFlex_755_Drive:O.Data[17]	DINT	DL From Net 16

Program Tags

To use the Controller tags that are automatically created, you need to create the following Program tags for this example program.

Name	Value	Data Type	Description
Command_Clear_Faults	0	BOOL	
Command_Forward_Reverse	0	BOOL	
Command_Jog	0	BOOL	
Command_Start	0	BOOL	
Command_Stop	0	BOOL	
Speed_Feedback	0.0	REAL	
Speed_Reference	0.0	REAL	
Status_Active	0	BOOL	
Status_At_Speed	0	BOOL	
Status_Faulted	0	BOOL	
Status_Forward	0	BOOL	
Status_Ready	0	BOOL	
Status_Reverse	0	BOOL	

Figure 16 - ControlLogix Controller Example Ladder Logic Program Using a Drive Generic Profile for Logic Status/Feedback

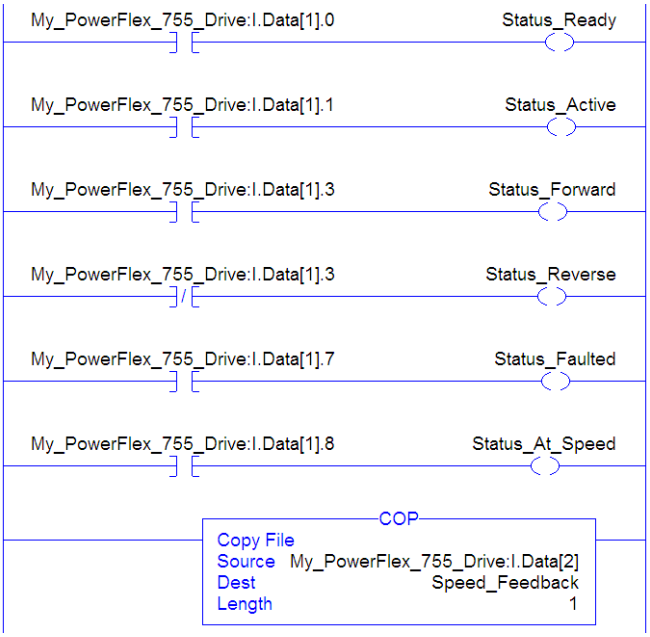
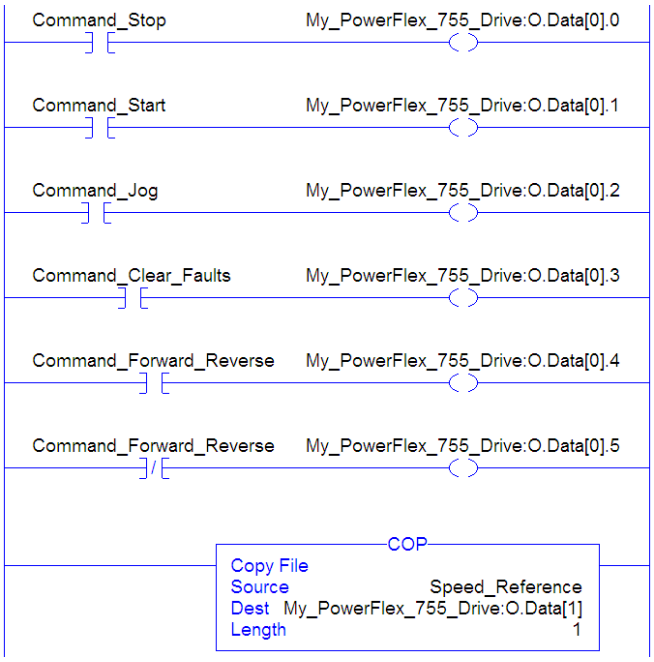


Figure 17 - ControlLogix Controller Example Ladder Logic Program Using a Drive Generic Profile for Logic Command/Reference



Example Datalink Data

The Datalink data used in the example program is shown in Figure 18. Note that to describe the parameters to which the Datalinks are assigned, you may want to add descriptions to the automatically-created generic controller tags or create a UDDT. For this example, the DL_From_Net tags were created to describe the drive parameters to which these Datalinks are assigned. For example, DL_From_Net_01_Stop_Mode_A indicates that adapter **Parameter 01 - [DL From Net 01]** is assigned to drive parameter 370 - [Stop Mode A]. This same method applies to the DL_To_Net tags.

Figure 18 - ControlLogix Controller Example Datalinks for Ladder Logic Program Using a Drive Generic Profile

Name	Value	Style	Data Type
DL_From_Net	{...}		DL_From_Net
DL_From_Net._01_Stop_Mode_A	1	Decimal	DINT
DL_From_Net._02_Stop_Mode_B	2	Decimal	DINT
DL_From_Net._03_Accel_Time_1	2.5	Float	REAL
DL_From_Net._04_Accel_Time_2	5.0	Float	REAL
DL_From_Net._05_Decel_Time_1	7.5	Float	REAL
DL_From_Net._06_Decel_Time_2	10.0	Float	REAL
DL_From_Net._07_Jog_Acc_Dec_Time	12.5	Float	REAL
DL_From_Net._08_Jog_Speed_1	10.0	Float	REAL
DL_From_Net._09_Jog_Speed_2	15.0	Float	REAL
DL_From_Net._10_Preset_Speed_1	20.0	Float	REAL
DL_From_Net._11_Preset_Speed_2	25.0	Float	REAL
DL_From_Net._12_Preset_Speed_3	30.0	Float	REAL
DL_From_Net._13_Preset_Speed_4	35.0	Float	REAL
DL_From_Net._14_Preset_Speed_5	40.0	Float	REAL
DL_From_Net._15_Preset_Speed_6	45.0	Float	REAL
DL_From_Net._16_Preset_Speed_7	50.0	Float	REAL
DL_To_Net	{...}		DL_To_Net
DL_To_Net._01_Stop_Mode_A	1	Decimal	DINT
DL_To_Net._02_Stop_Mode_B	2	Decimal	DINT
DL_To_Net._03_Accel_Time_1	2.5	Float	REAL
DL_To_Net._04_Accel_Time_2	5.0	Float	REAL
DL_To_Net._05_Decel_Time_1	7.5	Float	REAL
DL_To_Net._06_Decel_Time_2	10.0	Float	REAL
DL_To_Net._07_Jog_Acc_Dec_Time	12.5	Float	REAL
DL_To_Net._08_Jog_Speed_1	10.0	Float	REAL
DL_To_Net._09_Jog_Speed_2	15.0	Float	REAL
DL_To_Net._10_Preset_Speed_1	20.0	Float	REAL
DL_To_Net._11_Preset_Speed_2	25.0	Float	REAL
DL_To_Net._12_Preset_Speed_3	30.0	Float	REAL
DL_To_Net._13_Preset_Speed_4	35.0	Float	REAL
DL_To_Net._14_Preset_Speed_5	40.0	Float	REAL
DL_To_Net._15_Preset_Speed_6	45.0	Float	REAL
DL_To_Net._16_Preset_Speed_7	50.0	Float	REAL

TIP To determine whether a parameter is a 32-bit integer (DINT) or a REAL data type, see the Data Type column in the chapter containing parameters in the PowerFlex 750-Series AC Drives Programming Manual, publication 750-PM001. If a parameter is a REAL, a COP (Copy) instruction or UDDT is needed to copy the DINT to a REAL (inputs) or copy the REAL to a DINT (outputs).

Using Explicit Messaging

This chapter provides information and examples that explain how to use Explicit Messaging with a ControlLogix controller to configure and monitor the adapter and connected PowerFlex 755 drive.

For information on using a PLC-5, SLC 500, or MicroLogix 1100/1400 controller, see Controller Examples for EtherNet/IP Network Communications with PowerFlex 750-Series Drives, publication 750COM-AT001.

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ControlLogix Controller Examples	94

ATTENTION: Risk of injury or equipment damage exists. The examples in this publication are intended solely for purposes of example. There are many variables and requirements with any application. Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication.

ATTENTION: Risk of equipment damage exists. If Explicit Messages are programmed to write parameter data to Nonvolatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently uses Explicit Messages to write parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters.

See Chapter 5 for information about the I/O Image, using Logic Command/Status, Reference/Feedback, and Datalinks.

About Explicit Messaging

Explicit Messaging is used to transfer data that does not require continuous updates. With Explicit Messaging, you can configure and monitor a slave device's parameters on the network.

IMPORTANT When an explicit message is performed, by default no connection is made since it is an 'unconnected' message. When timing of the message transaction is important, you can create a dedicated message connection between the controller and drive by checking the 'Connected' box on the Communications tab message configuration dialog box during message setup. These message connections are in addition to the I/O connection. However, the trade off for more message connections is decreased network performance. If your application cannot tolerate this, do not check the 'Connected' box, which is recommended.

TIP To message to another device in a different drive port, see the Instance table in Appendix C:

- DPI Parameter Object section on page 148 for *Device* parameters.
- Host DPI Parameter Object section on page 162 for *Host* parameters.

In the Message Configuration dialog box, set the Instance field to an appropriate value within the range listed for the port in which the device resides.

IMPORTANT PowerFlex 750-Series drives have explicit messaging limitations. Table 4 shows the EtherNet/IP Object Class code compatibilities for these drives.

Table 4 - Explicit Messaging Class Code Compatibility with PowerFlex 750-Series Drive

EtherNet/IP Object Class Code	Compatibility	Explicit Messaging Function
Parameter Object 0x0F	No	Single parameter reads/writes
DPI Parameter Object 0x93	Yes (1) with limitations	Single and scattered parameter reads/writes
Host DPI Parameter Object 0x9F	Yes (2) with limitations	Single and scattered parameter reads/writes

(1) Enables access to drive parameters (Port 0), DPI device parameters (Ports 1…6 only), and Host parameters (Ports 7…14 only). For example, DPI Parameter Object Class code 0x93 can access a Safe Speed Monitor Option Module in Port 6. However, Class code 0x93 cannot access, for example, the Host parameters in a 24V I/O Option Module in Port 5. See DPI Parameter Object on page 148 for instance (parameter) numbering.

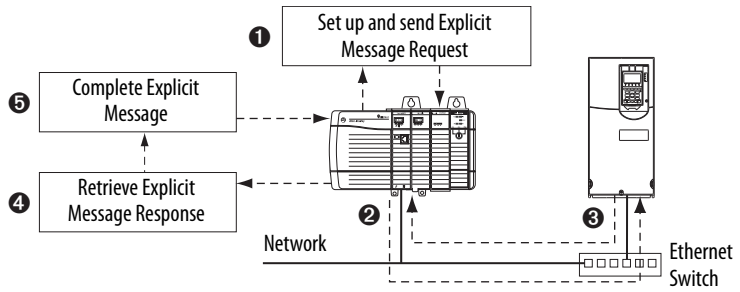
(2) Enables access to drive parameters (Port 0) and Host parameters for all ports (1…14). Host DPI Parameter Object Class code 0x9F cannot access DPI (device) parameters. For example, if a 20-750-DNET option module is in Port 4, its Host parameters can be accessed, but not its DPI (device) parameters. See Host DPI Parameter Object on page 162 for instance (parameter) numbering.

Performing Explicit Messaging

There are five basic events in the Explicit Messaging process. The details of each step will vary depending on the type of controller being used. See the documentation for your controller.

IMPORTANT There must be a request message and a response message for all Explicit Messages, whether you are reading or writing data.

Figure 19 - Explicit Message Process



Event	Description
❶	You format the required data and set up the ladder logic program to send an Explicit Message request to the scanner or bridge module (download).
❷	The scanner or bridge module transmits the Explicit Message Request to the slave device over the network.
❸	The slave device transmits the Explicit Message Response back to the scanner. The data is stored in the scanner buffer.
❹	The controller retrieves the Explicit Message Response from the scanner's buffer (upload).
❺	The Explicit Message is complete.

For information on the maximum number of Explicit Messages that can be executed at a time, see the documentation for the bridge or scanner and/or controller that is being used.

ControlLogix Controller Examples

TIP To display the Message Configuration dialog box in RSLogix 5000 software, add a message instruction (MSG), create a new tag for the message (Properties: Base tag type, MESSAGE data type, controller scope), and click the ... button in the message instruction.

For supported classes, instances, and attributes, see Appendix C, EtherNet/IP Objects.

IMPORTANT The explicit messaging examples in this section can be performed with RSLogix 5000 software, any version—or Studio 5000™ Logix Designer application, version 21.00 or later.

IMPORTANT The read and write messaging examples in this section are for *Device* parameters which use Class Code 0x93. For *Host* parameters, use Class Code 0x9F and format the rest of the message in the same way as these examples.

The Message Configuration has a Service Type of 'Parameter Read' which is Class code 0x0F, Parameter Object. Parameter Object is not supported in PowerFlex 750-series drives.

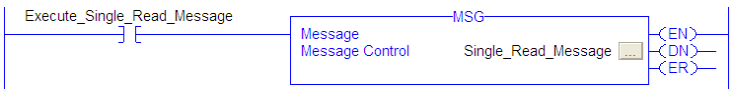
ControlLogix Controller Example Ladder Logic Program to Read a Single Parameter

A Get Attribute Single message is used to read a single parameter. This read message example reads the value of the 32-bit REAL (floating point) parameter 007 - [Output Current] in a PowerFlex 750-Series drive.

Table 5 - Example Controller Tags to Read a Single Parameter

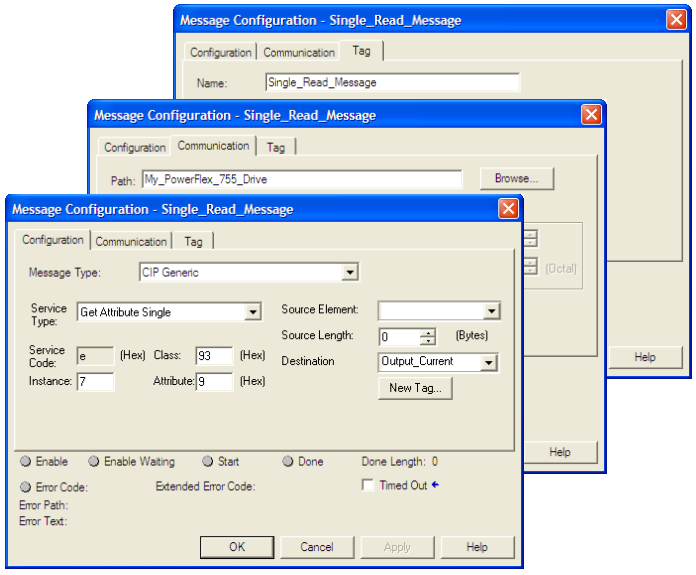
Operand	Controller Tags for Single Read Message	Data Type
XIC	Execute_Single_Read_Message	BOOL
MSG	Single_Read_Message	MESSAGE

Figure 20 - Example Ladder Logic to Read a Single Parameter



ControlLogix – Formatting a Message to Read a Single Parameter

Figure 21 - Get Attribute Single Message Configuration Dialog Boxes



The following table identifies the data that is required in each box to configure a message to read a single parameter.

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the adapter.
Service Type (1)	Get Attribute Single	This service is used to read a parameter value.
Service Code (1)	e (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) (4)	Class ID for the DPI Parameter Object.
Instance (2)	7 (Dec.)	Instance number is the same as parameter number.
Attribute	9 (Hex.)	Attribute number for the Parameter Value attribute.
Source Element	—	Leave blank (not applicable).
Source Length	0 bytes	Number of bytes of service data to be sent in the message.
Destination	Output_Current (5)	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path (3)	My_PowerFlex_755_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Single_Read_Message	The name for the message.

(1) The default setting for Service Type is 'Custom', enabling entry of a Service Code not available from the Service Type pull-down menu. When choosing a Service Type other than 'Custom' from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box which is dimmed (unavailable).

(2) The instance is the parameter number in the drive (Port 0). For example, to read parameter 4 of a peripheral in Port 5 of a PowerFlex 755 drive, the instance would be 21504 + 4 = 21508. See DPI Parameter Object on page 148 (Class code 0x93) or Host DPI Parameter Object on page 162 (Class code 0x9F) to determine the instance number.

(3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, My_PowerFlex_755_Drive).

(4) See Table 4 on page 92 for limitations of PowerFlex 750-Series drives when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F for explicit messaging.

(5) In this example, Output Current is a 32-bit REAL (floating point) parameter requiring the Data Type field to be set to 'REAL' when creating the controller tag. To read a 32-bit integer parameter, set the tag Data Type field to 'DINT'. For a 16-bit parameter, set the Data Type field to 'INT'. See the drive documentation to determine the size of the parameter and its data type.

ControlLogix Controller Example Ladder Logic Program to Write a Single Parameter

A Set Attribute Single message is used to write to a single parameter. This write message example writes a value to the 32-bit REAL (floating point) parameter 535 - [Accel Time 1] in a PowerFlex 750-Series drive.

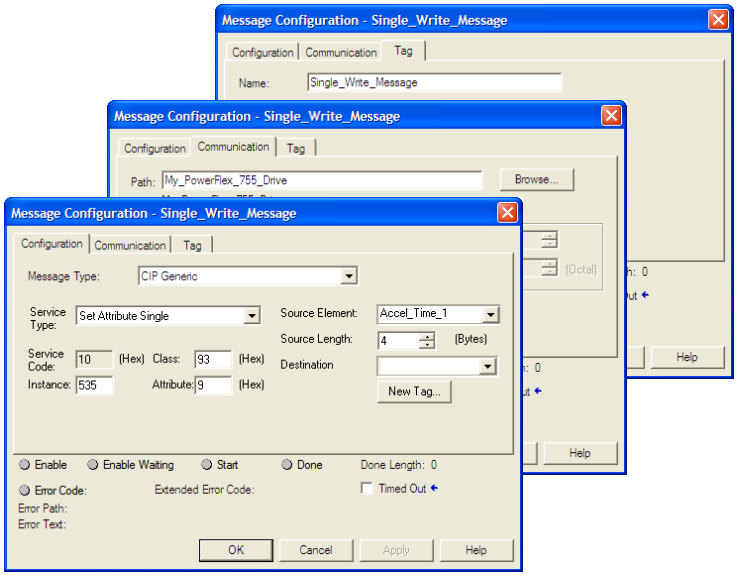
Table 6 - Example Controller Tags to Write a Single Parameter

Operand	Controller Tags for Single Write Message	Data Type
XIC	Execute_Single_Write_Message	BOOL
MSG	Single_Write_Message	MESSAGE

Figure 22 - Example Ladder Logic to Write a Single Parameter

ControlLogix – Formatting a Message to Write a Single Parameter

Figure 23 - Set Attribute Single Message Configuration Dialog Boxes



The following table identifies the data that is required in each box to configure a message to write a single parameter.

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the adapter.
Service Type (1)	Set Attribute Single	This service is used to write a parameter value.
Service Code (1)	10 (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) (5)	Class ID for the DPI Parameter Object.
Instance (2)	535 (Dec.)	Instance number is the same as parameter number.
Attribute (3)	9 or A (Hex.)	Attribute number for the Parameter Value attribute.
Source Element	Accel_Time_1 (6)	Name of the tag for any service data to be sent from the scanner or bridge to the adapter/drive.
Source Length	4 bytes (6)	Number of bytes of service data to be sent in the message.
Destination	—	Leave blank (not applicable).
Communication Tab	**Example Value**	**Description**
Path (4)	My_PowerFlex_755_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Single_Write_Message	The name for the message.

(1) The default setting for Service Type is 'Custom', enabling entry of a Service Code not available from the Service Type pull-down menu. When choosing a Service Type other than 'Custom' from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box which is dimmed (unavailable).

(2) The instance is the parameter number in the drive (Port 0). For example, to write to parameter 4 of a peripheral in Port 5 of a PowerFlex 755 drive, the instance would be 21504 + 4 = 21508. See DPI Parameter Object on page 148 (Class code 0x93) or Host DPI Parameter Object on page 162 (Class code 0x9F) to determine the instance number.

(3) Setting the Attribute value to '9' will write the parameter value to the drive's Non-Volatile Storage (EEPROM) memory, which retains the parameter value even after the drive is power cycled. **Important:** When set to '9', the EEPROM may quickly exceed its life cycle and cause the drive to malfunction. Setting the Attribute value to 'A' will write the parameter value to temporary memory, which deletes the parameter value after the drive is power cycled. When frequent write messages are required, we recommended using the 'A' setting.

(4) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, My_PowerFlex_755_Drive).

(5) See Table 4 on page 92 for limitations of PowerFlex 750-Series drives when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F for explicit messaging.

(6) In this example, Accel Time 1 is a 32-bit REAL (floating point) parameter requiring the Data Type field to be set to 'REAL' when creating the controller tag. To write to a 32-bit integer parameter, set the tag Data Type field to 'DINT'. For a 16-bit parameter, set the Data Type field to 'INT'. Also, the Source Length field on the Message Configuration dialog box must correspond to the selected Data Type in bytes (for example, 4 bytes for a REAL or DINT, or 2 bytes for an INT). See the drive documentation to determine the size of the parameter and its data type.

ControlLogix Controller Example Ladder Logic Program to Read Multiple Parameters

A Scattered Read message is used to read the values of multiple parameters. This read message example reads the values of these five 32-bit REAL (floating point) parameters in a PowerFlex 750-Series drive:

- Parameter 001 - [Output Frequency]
- Parameter 007 - [Output Current]
- Parameter 008 - [Output Voltage]
- Parameter 009 - [Output Power]
- Parameter 011 - [DC Bus Volts]

See DPI Parameter Object on page 148 (Class code 0x93) or Host DPI Parameter Object on page 162 (Class code 0x9F) for parameter numbering.

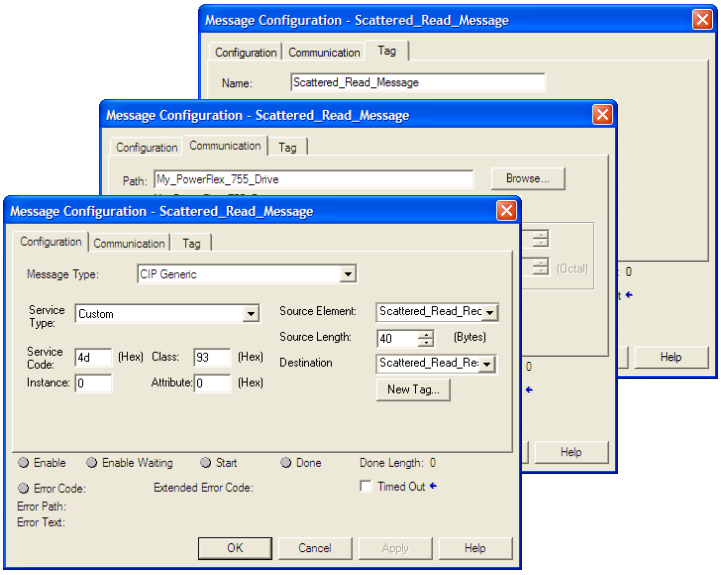
Table 7 - Example Controller Tags to Read Multiple Parameters

Operand	Controller Tags for Scattered Read Message	Data Type
XIC	Execute_Scattered_Read_Message	BOOL
MSG	Scattered_Read_Message	MESSAGE

Figure 24 - Example Ladder Logic to Read Multiple Parameters

ControlLogix – Formatting a Message to Read Multiple Parameters

Figure 25 - Scattered Read Message Configuration Dialog Boxes



The following table identifies the data that is required in each box to configure a message to read multiple parameters.

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the adapter.
Service Type (1)	Custom	Required for scattered messages.
Service Code (1)	4d (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) (3)	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute	0 (Hex.)	Required for scattered messages.
Source Element	Scattered_Read_Request (4)	Name of the tag for any service data to be sent from scanner or bridge to the adapter/drive.
Source Length	40 bytes (4)	Number of bytes of service data to be sent in the message.
Destination	Scattered_Read_Response (5)	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path (2)	My_PowerFlex_755_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Scattered_Read_Message	The name for the message.

(1) The default setting for Service Type is 'Custom', enabling entry of a Service Code not available from the Service Type pull-down menu. When choosing a Service Type other than 'Custom' from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box which is dimmed (unavailable). When reading 32-bit REAL (floating point) parameters, as in this example, data conversion using COP (Copy) instructions or UDDTs is required to correctly show the parameter values.

(2) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, My_PowerFlex_755_Drive).

(3) See Table 4 on page 92 for limitations of PowerFlex 750-Series drives when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F for explicit messaging.

(4) In this example, we are reading five 32-bit REAL (floating point) parameters. Each parameter being read requires two contiguous DINT registers. Therefore, a controller tag was created with its Data Type field set to 'DINT[10]'. Also, the Source Length field on the Message Configuration dialog box must correspond to the selected Data Type in bytes (for this example, 40 bytes for a DINT[10] array). Scattered read messages always assume that every parameter being read is a 32-bit parameter, regardless of its actual size. Maximum message length is 256 bytes which can read up to 32 parameters, regardless of their size. For parameter numbering, see DPI Parameter Object on page 148 (Class code 0x93) or Host DPI Parameter Object on page 162 (Class code 0x9F).

(5) The controller tag for 'Scattered_Read_Response' must be the same size as the controller tag for 'Scattered_Read_Request' (for this example, 40 bytes), but can be a different data type (for this example, a UDDT to handle conversions to parameter values that are a REAL data type).

ControlLogix Controller Example Scattered Read Request Data

In this message example, we use the data structure in Figure 26 in the source tag named Scattered Read Request to read these five 32-bit REAL (floating point) parameters in a PowerFlex 750-Series drive:

- Parameter 001 - [Output Frequency]
- Parameter 007 - [Output Current]
- Parameter 008 - [Output Voltage]
- Parameter 009 - [Output Power]
- Parameter 011 - [DC Bus Volts]

See DPI Parameter Object on page 148 (Class code 0x93) or Host DPI Parameter Object on page 162 (Class code 0x9F) for parameter numbering.

Figure 26 - Example Scattered Read Request Data

Name	Value	Data Type	Description
Scattered_Read_Request	{...}	DINT[10]	
Scattered_Read_Request[0]	1	DINT	Parameter Number (decimal)
Scattered_Read_Request[1]	0	DINT	Pad Word
Scattered_Read_Request[2]	7	DINT	Parameter Number (decimal)
Scattered_Read_Request[3]	0	DINT	Pad Word
Scattered_Read_Request[4]	8	DINT	Parameter Number (decimal)
Scattered_Read_Request[5]	0	DINT	Pad Word
Scattered_Read_Request[6]	9	DINT	Parameter Number (decimal)
Scattered_Read_Request[7]	0	DINT	Pad Word
Scattered_Read_Request[8]	11	DINT	Parameter Number (decimal)
Scattered_Read_Request[9]	0	DINT	Pad Word

ControlLogix Controller Example Scattered Read Response Data

The Scattered Read Request message reads the multiple parameters and returns their values to the destination tag (Scattered_Read_Response). Figure 27 shows the parameter values which, in this example, have been converted using a UDDT for correct presentation. COP (Copy) instructions could have been used for this purpose instead of a UDDT. If the parameters being read are a 32-bit integers, do not COP the data to a REAL tag.

Figure 27 - Example Scattered Read Response Converted Data

Name	Value	Data Type	Description
Scattered_Read_Response	{...}	Scattered_Rea...	
Scattered_Read_Response.Output_Frequency_Par_No	1	DINT	
Scattered_Read_Response.Output_Frequency_Par_Value	60.205975	REAL	
Scattered_Read_Response.Output_Current_Par_No	7	DINT	
Scattered_Read_Response.Output_Current_Par_Value	12.570678	REAL	
Scattered_Read_Response.Output_Voltage_Par_No	8	DINT	
Scattered_Read_Response.Output_Voltage_Par_Value	418.34348	REAL	
Scattered_Read_Response.Output_Power_Par_No	9	DINT	
Scattered_Read_Response.Output_Power_Par_Value	12.3584	REAL	
Scattered_Read_Response.DC_Bus_Volts_Par_No	11	DINT	
Scattered_Read_Response.DC_Bus_Volts_Par_Value	566.5277	REAL	

In this message example, the parameters have the following values:

PowerFlex 750-Series Drive Parameter	Read Value
1 - [Output Frequency]	60.205975 Hz
7 - [Output Current]	12.570678 Amp
8 - [Output Voltage]	418.34348V AC
9 - [Output Power]	12.3534 kW
11 - [DC Bus Volts]	566.5277V DC

ControlLogix Controller Example Ladder Logic Program to Write Multiple Parameters

A Scattered Write message is used to write to multiple parameters. This write message example writes the following values to these five 32-bit REAL (floating point) parameters in a PowerFlex 750-Series drive:

PowerFlex 750-Series Drive Parameter	Write Value
536 - [Accel Time 2]	11.1 Sec
538 - [Decel Time 2]	22.2 Sec
575 - [Preset Speed 5]	33.3 Hz
576 - [Preset Speed 6]	44.4 Hz
577 - [Preset Speed 7]	55.5 Hz

See DPI Parameter Object on page 148 (Class code 0x93) or Host DPI Parameter Object on page 162 (Class code 0x9F) for parameter numbering.

Table 8 - Example Controller Tags to Write Multiple Parameters

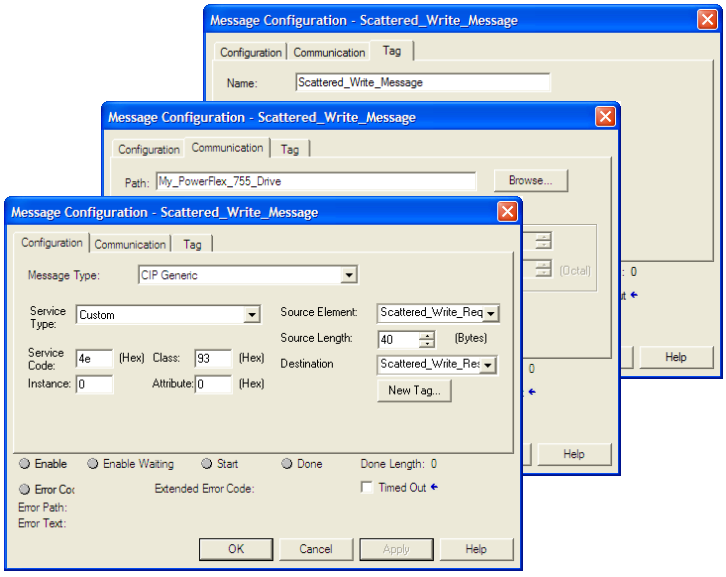
Operand	Controller Tags for Scattered Write Message	Data Type
XIC	Execute_Scattered_Write_Message	BOOL
MSG	Scattered_Write_Message	MESSAGE

Figure 28 - Example Ladder Logic to Write Multiple Parameters

IMPORTANT If the explicit message scattered write must be written continuously, then use a separate explicit message single write for each parameter using DPI Parameter Object Class code 0x93 and attribute A (see page 97). Attribute A writes to RAM—not NVS (EEPROM) memory. This example scattered write message using attribute 0 writes to NVS. Over time, continuous writes will exceed the EEPROM life cycle and cause the drive to malfunction.

ControlLogix – Formatting a Message to Write Multiple Parameters

Figure 29 - Scattered Write Multiple Message Configuration Dialog Boxes



The following table identifies the data that is required in each box to configure a message to write multiple parameters.

Configuration Tab	Example Value	Description
Message Type	CIP Generic	Used to access the DPI Parameter Object in the adapter.
Service Type (1)	Custom	Required for scattered messages.
Service Code (1)	4e (Hex.)	Code for the requested service.
Class	93 or 9F (Hex.) (4)	Class ID for the DPI Parameter Object.
Instance	0 (Dec.)	Required for scattered messages.
Attribute (2)	0 (Hex.)	Required for scattered messages.
Source Element	Scattered_Write_Request (5)	Name of the tag for any service data to be sent from scanner or bridge to the adapter/drive.
Source Length	40 bytes (5)	Number of bytes of service data to be sent in the message.
Destination	Scattered_Write_Response (6)	The tag where the data that is read is stored.
Communication Tab	**Example Value**	**Description**
Path (3)	My_PowerFlex_755_Drive	The path is the route that the message will follow.
Tag Tab	**Example Value**	**Description**
Name	Scattered_Write_Message	The name for the message.

(1) The default setting for Service Type is 'Custom', enabling entry of a Service Code not available from the Service Type pull-down menu. When choosing a Service Type other than 'Custom' from the pull-down menu, an appropriate Hex. value is automatically assigned to the Service Code box which is dimmed (unavailable). When writing to 32-bit REAL (floating point) parameters, as in this example, data conversion using COP (Copy) instructions or UDDTs is required to correctly write the parameter values.

(2) Scattered writes always write parameter values to the drive's Non-Volatile Storage (EEPROM) memory, which retains these values even after the drive is power cycled. **Important:** Be very cautious as the EEPROM may quickly exceed its life cycle and cause the drive to malfunction.

(3) Click **Browse** to find the path, or type in the name of the device listed in the I/O Configuration folder (for this example, My_PowerFlex_755_Drive).

(4) See Table 4 on page 92 for limitations of PowerFlex 750-Series drives when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F for explicit messaging.

(5) In this example, we are writing to five 32-bit REAL (floating point) parameters. Each parameter being written to requires two contiguous DINT registers. Therefore, a controller tag was created with its Data Type field set to the name of the UDDT of five interleaved DINTs and REALs. Also, the Source Length field on the Message Configuration dialog box must correspond to the selected Data Type in bytes (for this example, 40 bytes for an array of five scattered REAL structures). Scattered write messages always assume that every parameter being written to is a 32-bit parameter, regardless of its actual size. Maximum message length is 256 bytes which can write up to 32 parameters, regardless of their size. For parameter numbering, see DPI Parameter Object on page 148 (Class code 0x93) or Host DPI Parameter Object on page 162 (Class code 0x9F).

(6) The controller tag for 'Scattered_Write_Response' must be the same size as the controller tag for 'Scattered_Write_Request' (for this example, 40 bytes). An array of DINTs is suggested to be able to read any error codes that are returned.

ControlLogix Controller Example Scattered Write Request Data

In this message example, we use the data structure in Figure 30 in the source tag (Scattered_Write_Request) to write new values to these 32-bit REAL (floating point) parameters:

PowerFlex 750-Series Drive Parameter	Write Value
536 - [Accel Time 2]	11.1 Sec
538 - [Decel Time 2]	22.2 Sec
575 - [Preset Speed 5]	33.3 Hz
576 - [Preset Speed 6]	44.4 Hz
577 - [Preset Speed 7]	55.5 Hz

See DPI Parameter Object on page 148 (Class code 0x93) or Host DPI Parameter Object on page 162 (Class code 0x9F) for parameter numbering.

Figure 30 shows the parameter values which, in this example, have been converted using a UDDT to correctly write their values. COP (Copy) instructions could have been used for this purpose instead of a UDDT. If the parameters being written to are 32-bit integers, do not COP the data to a REAL tag.

Figure 30 - Example Scattered Write Request Converted Data

Name	Value	Data Type	Description
Scattered_Write_Request	{...}	Scattered_Writ...	
Scattered_Write_Request.Accel_Time_2_Par_No	536	DINT	
Scattered_Write_Request.Accel_Time_2_Par_Value	11.1	REAL	
Scattered_Write_Request.Decel_Time_2_Par_No	538	DINT	
Scattered_Write_Request.Decel_Time_2_Par_Value	22.2	REAL	
Scattered_Write_Request.Preset_Speed_5_Par_No	575	DINT	
Scattered_Write_Request.Preset_Speed_5_Par_Value	33.3	REAL	
Scattered_Write_Request.Preset_Speed_6_Par_No	576	DINT	
Scattered_Write_Request.Preset_Speed_6_Par_Value	44.4	REAL	
Scattered_Write_Request.Preset_Speed_7_Par_No	577	DINT	
Scattered_Write_Request.Preset_Speed_7_Par_Value	55.5	REAL	

ControlLogix Controller Example Scattered Write Response Data

The results of the message appear in the destination tag named Scattered_Write_Response (Figure 31). Values of ‘0’ indicate no errors occurred.

Figure 31 - Example Scattered Write Response Data

Name	Value	Data Type	Description
Scattered_Write_Response	{...}	DINT[10]	
Scattered_Write_Response[0]	536	DINT	
Scattered_Write_Response[1]	0	DINT	
Scattered_Write_Response[2]	538	DINT	
Scattered_Write_Response[3]	0	DINT	
Scattered_Write_Response[4]	575	DINT	
Scattered_Write_Response[5]	0	DINT	
Scattered_Write_Response[6]	576	DINT	
Scattered_Write_Response[7]	0	DINT	
Scattered_Write_Response[8]	577	DINT	
Scattered_Write_Response[9]	0	DINT	

ControlLogix Controller – Explanation of Request and Response Data for Read/Write Multiple Messaging

The data structures in Table 9 and Table 10 use 32-bit words and can accommodate up to 32 parameters in a single message. In the Response Message, a parameter number with Bit 15 set indicates that the associated parameter value field contains an error code (parameter number in response data will be negative).

The PowerFlex 750-Series AC Drives Programming Manual, publication 750-PM001, lists the data type for each parameter. When performing a Scattered Read of REAL data type parameters, the DINT parameter value in the Response (Destination Data) array will need to be COP to a REAL tag.

Table 9 - Data Structures for Scattered Read Messages

	Request (Source Data)		Response (Destination Data)
DINT 0	Parameter Number	DINT 0	Parameter Number
1	Pad	1	Parameter Value
2	Parameter Number	2	Parameter Number
3	Pad	3	Parameter Value
4	Parameter Number	4	Parameter Number
5	Pad	5	Parameter Value
6	Parameter Number	6	Parameter Number
7	Pad	7	Parameter Value
8	Parameter Number	8	Parameter Number
9	Pad	9	Parameter Value
10	Parameter Number	10	Parameter Number
11	Pad	11	Parameter Value
12	Parameter Number	12	Parameter Number
13	Pad	13	Parameter Value
14	Parameter Number	14	Parameter Number
15	Pad	15	Parameter Value
16	Parameter Number	16	Parameter Number
17	Pad	17	Parameter Value
18	Parameter Number	18	Parameter Number
19	Pad	19	Parameter Value
20	Parameter Number	20	Parameter Number
21	Pad	21	Parameter Value
22	Parameter Number	22	Parameter Number
23	Pad	23	Parameter Value
24	Parameter Number	24	Parameter Number
25	Pad	25	Parameter Value
26	Parameter Number	26	Parameter Number
27	Pad	27	Parameter Value
28	Parameter Number	28	Parameter Number
29	Pad	29	Parameter Value
30	Parameter Number	30	Parameter Number
31	Pad	31	Parameter Value
32	Parameter Number	32	Parameter Number
33	Pad	33	Parameter Value
34	Parameter Number	34	Parameter Number
35	Pad	35	Parameter Value
⋮		⋮	
62	Parameter Number	62	Parameter Number
63	Pad	63	Parameter Value

When performing a Scattered Write to REAL data type parameters, the REAL parameter value will need to be COP to the DINT parameter value tag in the Request (Source Data) array.

Table 10 - Data Structures for Scattered Write Messages

	Request (Source Data)		Response (Destination Data)
DINT 0	Parameter Number	DINT 0	Parameter Number
1	Parameter Value	1	Pad
2	Parameter Number	2	Parameter Number
3	Parameter Value	3	Pad
4	Parameter Number	4	Parameter Number
5	Parameter Value	5	Pad
6	Parameter Number	6	Parameter Number
7	Parameter Value	7	Pad
8	Parameter Number	8	Parameter Number
9	Parameter Value	9	Pad
10	Parameter Number	10	Parameter Number
11	Parameter Value	11	Pad
12	Parameter Number	12	Parameter Number
13	Parameter Value	13	Pad
14	Parameter Number	14	Parameter Number
15	Parameter Value	15	Pad
16	Parameter Number	16	Parameter Number
17	Parameter Value	17	Pad
18	Parameter Number	18	Parameter Number
19	Parameter Value	19	Pad
20	Parameter Number	20	Parameter Number
21	Parameter Value	21	Pad
22	Parameter Number	22	Parameter Number
23	Parameter Value	23	Pad
24	Parameter Number	24	Parameter Number
25	Parameter Value	25	Pad
26	Parameter Number	26	Parameter Number
27	Parameter Value	27	Pad
28	Parameter Number	28	Parameter Number
29	Parameter Value	29	Pad
30	Parameter Number	30	Parameter Number
31	Parameter Value	31	Pad
32	Parameter Number	32	Parameter Number
33	Parameter Value	33	Pad
34	Parameter Number	34	Parameter Number
35	Parameter Value	35	Pad
⋮		⋮	
62	Parameter Number	62	Parameter Number
63	Parameter Value	63	Pad

Notes:

Troubleshooting

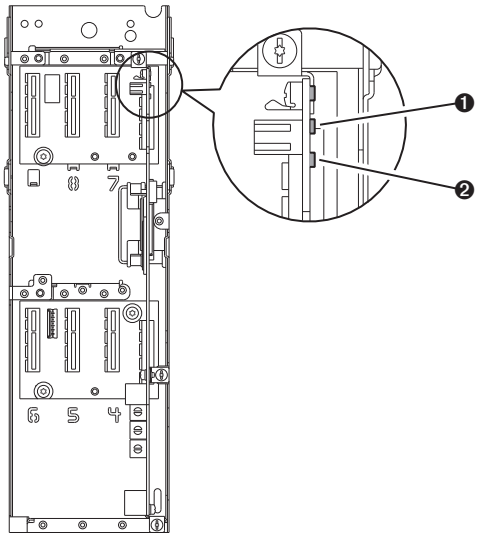
This chapter provides information for diagnosing and troubleshooting potential problems with the adapter and network.

Topic	Page
Understanding the Status Indicators	107
ENET Status Indicator	108
LINK Status Indicator	108
Viewing Adapter Diagnostic Items	109
Viewing and Clearing Events	111

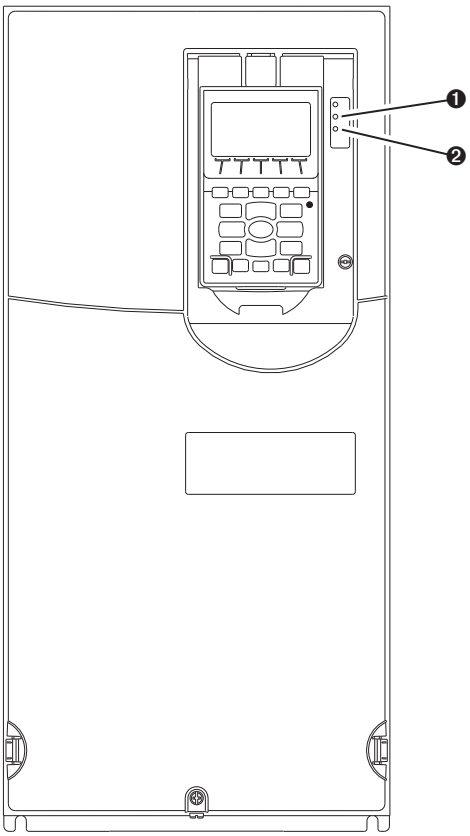
Understanding the Status Indicators

The adapter has two status indicators. They can be viewed with the drive HIM bezel closed or open.

Embedded EtherNet/IP adapter indicators are located on main control board in drive control pod.



Indicators shown with HIM bezel closed and drive cover installed.



Item	Indicator Name	Description	Page
❶	ENET	EtherNet/IP Connection Status	108
❷	LINK	EtherNet/IP Transmit Status	108

ENET Status Indicator

This red/green bicolor LED indicates the status of the adapter's network connection as shown in the table below.

Status	Cause	Corrective Actions
Off	The adapter is not powered, the adapter is not properly connected to the network, or the adapter needs an IP address.	• Apply power to the drive. • Securely connect the adapter to the network using an Ethernet cable. Also, make sure the Ethernet cable is correctly connected to the Ethernet connector. • Set a unique IP address using the adapter switches, a BOOTP server, or by disabling BOOTP and using adapter parameters.
Steady Red	The adapter failed the duplicate IP address detection test.	Configure the adapter to use a unique IP address and cycle power.
Flashing Red	An EtherNet/IP connection has timed out.	• Apply power to the scanner or enable the peer device that will send I/O. • Check the IGMP Snooping/Ethernet Switches for correct operation. • Check the amount of traffic on the network.
Flashing Red/ Green	The adapter is performing a self-test.	No action required.
Flashing Green	The adapter is properly connected but is not communicating with any devices on the network.	• Place the controller in RUN mode, or apply power to the peer device that will send I/O. • Program the controller or peer device to recognize and transmit I/O or make a messaging connection to the adapter. • Configure the adapter for the program in the controller or the I/O from the peer device.
Steady Green	The adapter is properly connected and communicating on the network.	No action required.

LINK Status Indicator

This green LED indicates the status of the adapter transmitting on the network as shown in the table below.

Status	Cause	Corrective Actions
Off	The adapter is not powered or is not properly connected to the network.	• Apply power to the drive. • Securely connect the adapter to the network using an Ethernet cable. Also, make sure the Ethernet cable is correctly connected to the Ethernet connector.
Flashing Green	The adapter is transmitting on the network.	No action required.
Steady Green	The adapter is linked to the network and is ready to communicate.	• Set a unique IP address using the adapter switches, a BOOTP server, or by disabling BOOTP and using adapter parameters, and cycle power. • Check the IP address in the adapter and scanner, and verify that the controller can communicate with the adapter. • Ping the adapter. Normal condition if the adapter is idle.

Viewing Adapter Diagnostic Items

If you encounter unexpected communications problems, the adapter's diagnostic items may help you or Rockwell Automation personnel troubleshoot the problem. Adapter diagnostic items can be viewed with any of these drive configuration tools:

- PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM
- Connected Components Workbench software, version 1.02 or later
- DriveExplorer software, version 6.01 or later
- DriveExecutive software, version 5.01 or later.

For details on viewing diagnostic items with the HIM, see the PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication 20HIM-UM001.

Table 11 - Adapter Diagnostic Items

No.	Name	Description
1	Common Logic Cmd	The present value of the Common Logic Command being transmitted to the drive by this adapter.
2	Prod Logic Cmd	The present value of the Product Logic Command being transmitted to the drive by this adapter from the controller.
3	Reference	The present value of the Reference being transmitted to the drive by this adapter.
4	Common Logic Sts	The present value of the Common Logic Status being received from the drive by this adapter.
5	Prod Logic Sts	The present value of the Product Logic Status being received from the drive by this adapter from the controller.
6	Feedback	The present value of the Feedback being received from the drive by this adapter.
7	Input Size	The size of the input image in bytes transferred from the network to the drive.
8	Output Size	The size of the output image in bytes transferred from the drive to the network.
9	DL Fr Net Avail	The number of From Net Datalinks currently available to the adapter.
10	DL To Net Avail	The number of To Net Datalinks currently available to the adapter.
11	DL Fr Net 01 Val	The present value of respective **DL From Net xx** parameter being transmitted to the drive by this adapter. (If not using a Datalink, its respective value should be zero.)
12	DL Fr Net 02 Val	
13	DL Fr Net 03 Val	
14	DL Fr Net 04 Val	
15	DL Fr Net 05 Val	
16	DL Fr Net 06 Val	
17	DL Fr Net 07 Val	
18	DL Fr Net 08 Val	
19	DL Fr Net 09 Val	
20	DL Fr Net 10 Val	
21	DL Fr Net 11 Val	
22	DL Fr Net 12 Val	
23	DL Fr Net 13 Val	
24	DL Fr Net 14 Val	
25	DL Fr Net 15 Val	
26	DL Fr Net 16 Val	

Table 11 - Adapter Diagnostic Items (Continued)

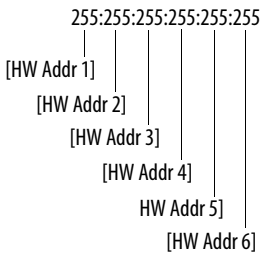
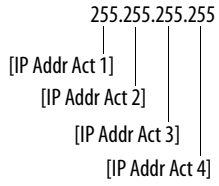
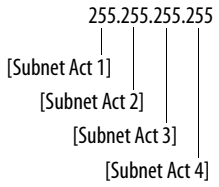
No.	Name	Description
27	DL To Net 01 Val	The present value of respective **DL To Net xx** parameter being received from the drive by this adapter. (If not using a Datalink, its respective value should be zero.)
28	DL To Net 02 Val	
29	DL To Net 03 Val	
30	DL To Net 04 Val	
31	DL To Net 05 Val	
32	DL To Net 06 Val	
33	DL To Net 07 Val	
34	DL To Net 08 Val	
35	DL To Net 09 Val	
36	DL To Net 10 Val	
37	DL To Net 11 Val	
38	DL To Net 12 Val	
39	DL To Net 13 Val	
40	DL To Net 14 Val	
41	DL To Net 15 Val	
42	DL To Net 16 Val	
43 44 45 46 47 48	HW Addr 1 HW Addr 2 HW Addr 3 HW Addr 4 HW Addr 5 HW Addr 6	Decimal value of each byte in the adapter's Ethernet hardware address. 
49 50 51 52	IP Addr Act 1 IP Addr Act 2 IP Addr Act 3 IP Addr Act 4	Value of each byte in the adapter's present IP address. A value of '0' appears if the adapter does not currently have an IP address. 
53 54 55 56	Subnet Act 1 Subnet Act 2 Subnet Act 3 Subnet Act 4	Value of each byte in the adapter's present subnet mask. A value of '0' appears if the adapter does not currently have a subnet mask. 

Table 11 - Adapter Diagnostic Items (Continued)

No.	Name	Description
57 58 59 60	Gateway Act 1 Gateway Act 2 Gateway Act 3 Gateway Act 4	Value of each byte in the adapter's present gateway address. A value of '0' appears if the adapter does not currently have a gateway address. 255.255.255.255 [Gateway Act 1] [Gateway Act 2] [Gateway Act 3] [Gateway Act 4]
61	Net Rx Overruns	A count of the number of receive buffer overruns reported by the Ethernet hardware.
62	Net Rx Packets	A count of the number of Ethernet packets that the adapter has received.
63	Net Rx Errors	A count of the number of receive errors reported by the Ethernet hardware.
64	Net Tx Packets	A count of the number of Ethernet packets that the adapter has sent.
65	Net Tx Errors	A count of the number of transmit errors reported by the Ethernet hardware.
66	Last TCP Reset	The last reason that the adapter reset or rejected a TCP/IP connection.
67	Missed IO Pkts	A count of the number of incoming I/O connection packets that the adapter did not receive.
68	Net Addr Sw	The present value of the adapter IP address switches.

Viewing and Clearing Events

The adapter has an event queue to record significant events that occur in the operation of the adapter. When such an event occurs, an entry consisting of the event's numeric code and a timestamp is put into the event queue. You can view the event queue with any of these drive configuration tools:

- PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM
- Connected Components Workbench software, version 1.02 or later
- DriveExplorer software, version 6.01 or later
- DriveExecutive software, version 5.01 or later

For details on viewing and clearing events with the HIM, see the PowerFlex 20-HIM-A6/-C6S HIM (Human Interface Module) User Manual, publication 20HIM-UM001.

The event queue can contain up to 32 entries, which are stored in an EEPROM chip— making the event queue non-volatile. Eventually the event queue will become full, since its contents are retained through adapter power cycles and resets. At that point, a new entry replaces the oldest entry. Only an event queue clear operation or the corruption of the EEPROM group containing the event queue will clear the event queue contents. In the latter case, the adapter will not generate a fault to indicate that the event queue was corrupted.

Resetting the adapter to defaults has no effect on the event queue, other than to log a Code 58 'Module Defaulted' event.

Many events in the event queue occur under normal operation. If you encounter unexpected communications problems, the events may help you or Allen-Bradley personnel troubleshoot the problem. The following events may appear in the event queue.

Table 12 - Adapter Events

Code	Event	Description
Adapter Events		
1	No Event	Text displayed in an empty event queue entry.
2	Device Power Up	Power was applied to the adapter.
3	Device Reset	The adapter was reset.
4	EEPROM CRC Error	The EEPROM checksum/CRC is incorrect, which limits adapter functionality. Default parameter values must be loaded to clear this condition.
5	App Updated	The adapter application firmware was flash updated.
6	Boot Updated	The adapter boot firmware was flash updated.
7-24	Reserved	—
DPI Events		
25	DPI Manual Reset	The adapter was reset.
26-28	Reserved	—
Network Events		
29	Net Link Up	An network link was available for the adapter.
30	Net Link Down	The network link was removed from the adapter.
31	Net Dup Address	The adapter uses the same IP address as another device on the network.
32	Net Comm Fault	The adapter detected a communications fault on the network.
33	Net Sent Reset	The adapter received a reset from the network.
34	Net IO Close	An I/O connection from the network to the adapter was closed.
35	Net Idle Fault	The adapter received 'idle' packets from the network.
36	Net IO Open	An I/O connection from the network to the adapter has been opened.
37	Net IO Timeout	An I/O connection from the network to the adapter has timed out.
38	Net IO Size Err	The adapter received an incorrectly sized I/O packet.
39	PCCC IO Close	The device sending PCCC Control messages to the adapter has set the PCCC Control Timeout to zero.
40	PCCC IO Open	The adapter has begun receiving PCCC Control messages (the PCCC Control Timeout was previously set to a non-zero value).
41	PCCC IO Timeout	The adapter has not received a PCCC Control message for longer than the PCCC Control Timeout.
42	Msg Ctrl Open	The timeout attribute in either the CIP Register or Assembly object was written with a non-zero value, allowing control messages to be sent to the adapter.
43	Msg Ctrl Close	The timeout attribute in either the CIP Register or Assembly object was written with a zero value, disallowing control messages to be sent to the adapter.
44	Msg Ctrl Timeout	The timeout attribute in either the CIP Register or Assembly object elapsed between accesses of those objects.
45	Peer IO Open	The adapter received the first Peer I/O message.
46	Peer IO Timeout	The adapter has not received a Peer I/O message for longer than the Peer I/O Timeout.
47-54	Reserved	—
55	BOOTP Response	The adapter received a response to its BOOTP request.
56	E-mail Failed	The adapter encountered an error attempting to send a requested e-mail message.
57	Option Card Flt	The adapter experienced a generic fault condition (drive only).
58	Module Defaulted	The adapter has been set to defaults.

Viewing the Adapter Web Pages

This chapter provides instructions on how to monitor the PowerFlex 755 drive and its embedded adapter by using the adapter's web interface.

Topic	Page
Enabling the Adapter Web Pages	113
Viewing the Web Pages	113
Process Display Pop-up Dialog Box	116
TCP/IP Configuration Web Page	117
Configure E-mail Notification Web Page	118
Device Information Pages	121

Future enhancements may result in adapter web pages that look different than the examples shown in this chapter.

Enabling the Adapter Web Pages

After the adapter is configured and operating, you can view its web pages. They present information about the adapter, the drive to which it is connected, and the other DPI devices connected to the drive such as a HIM.

By default the adapter web pages are disabled. To enable the adapter web pages, set **Parameter 52 - [Web Enable]** to '1' (Enabled) and then reset the adapter for the change to take effect.

Viewing the Web Pages

The adapter can be configured to automatically send e-mail messages to desired addresses when selected drive faults occur and/or are cleared, and/or when the adapter takes a communication or idle fault action.

Bit 0 of **Parameter 53 - [Web Features]** can be used to protect the configured settings. For more details, see Configure E-mail Notification Web Page on page 118.

1. On a computer with access to the EtherNet/IP network on which the drive/adapter is installed, launch a web browser such as Microsoft™ Internet Explorer, version 5.0 or later.

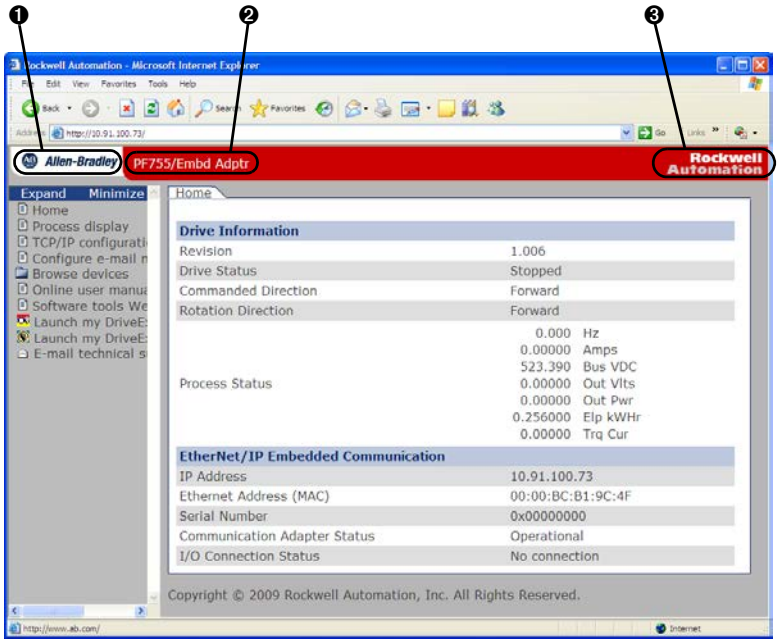
   The computer can access the adapter web pages if it is connected to:
   - The same network as the drive/adapter.
   - A network with access to the drive/adapter's network via a gateway device (for example, a router).

2. In the Address box, type the IP address of the adapter.
3. Press Enter.

   The adapter web Home Page (Figure 32) appears.

IMPORTANT	From the browser's View menu, choose Refresh to always re-display the adapter Home Page while viewing any of the adapter's other web pages.

Figure 32 - Adapter Web Home Page Example



Title Bar on Adapter Web Pages

The title bar appears on the adapter Home Page and all of the adapter's other web pages. The title bar consists of three elements as shown in Figure 32.

Title Bar Element	Description
❶ Allen-Bradley logo	This logo is a hyperlink. Click it to view the ab.com web Home Page.
❷ Adapter Title	Shows the adapter type or user-configured title.
❸ Rockwell Automation logo	This logo is a hyperlink. Click it to view the Rockwell Automation web Home Page.

Navigation Pane on Adapter Web Pages

The navigation pane appears on the left side of the adapter Home Page and all of the adapter's other web pages. The navigation pane consists of links and link folders which can be expanded or minimized. The following table shows all navigation pane links and link folders.

Navigation Pane Link/Folder	Description
Home link	Click this link to view the adapter's Home Page (Figure 32).
Process display link	Click this link to view the host drive's Process Display pop-up dialog box (Figure 33).
TCP/IP configuration link	Click this link to view the adapter's TCP/IP Configuration web page showing information about the TCP/IP configuration, such as the adapter's IP address and the number of packets being sent. Figure 34 shows an example TCP/IP Configuration web page.
Configure e-mail notification link	Click this link to view the adapter's Configure E-mail Notification web page (Figure 35) to configure the adapter to send automatic e-mail messages. An example e-mail message is shown in Figure 37.
Browse DPI devices folder	Click this folder to expand and view the Port folders for all present devices, including the drive, adapter, and other devices connected to the drive such as a HIM.
Port x folders	Click a respective Port folder to expand and view its device's various links which take you to related information pages. For Port 0 (PowerFlex 755 Drive) example information pages, see Figure 38, Figure 39, and Figure 40.
Online user manuals link	Click this link to view Rockwell Automation's web page with documentation for drives and other devices.
Software tools Web site link	Click this link to view Allen-Bradley's web page with information about software tools such as DriveExplorer and DriveExecutive.
Launch my DriveExplorer software link	Click this link to launch the DriveExplorer software already installed on your computer.
Launch my DriveExecutive software link	Click this link to launch the DriveExecutive software already installed on your computer.
E-mail technical support link	Click this link to view a new e-mail message dialog box to send a message to the Allen-Bradley Technical Support Team.

Information on Adapter Home Page

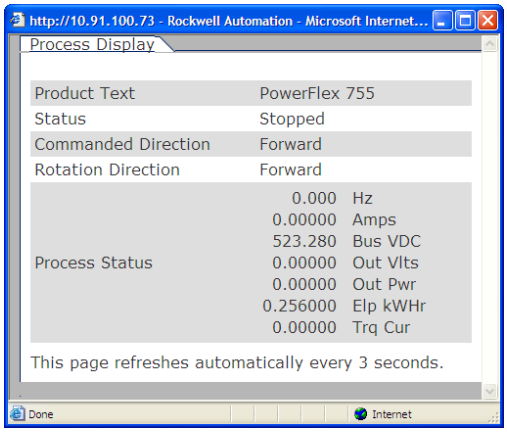
The adapter Home Page displays the following information for the host PowerFlex 755 drive and its embedded EtherNet/IP adapter.

Device	Information
Host PowerFlex 755 Drive	• Revision • Status • Commanded Direction • Rotation Direction • Process Status
Embedded EtherNet/IP Adapter	• IP Address • Ethernet Address (MAC) • Serial Number • Adapter Status • I/O Connection Status

Process Display Pop-up Dialog Box

The Process Display pop-up dialog box dynamically shows the host drive's information. To view this dialog box, click the 'Process display' link in the navigation pane.

Figure 33 - Example of Process Display Pop-up Dialog Box

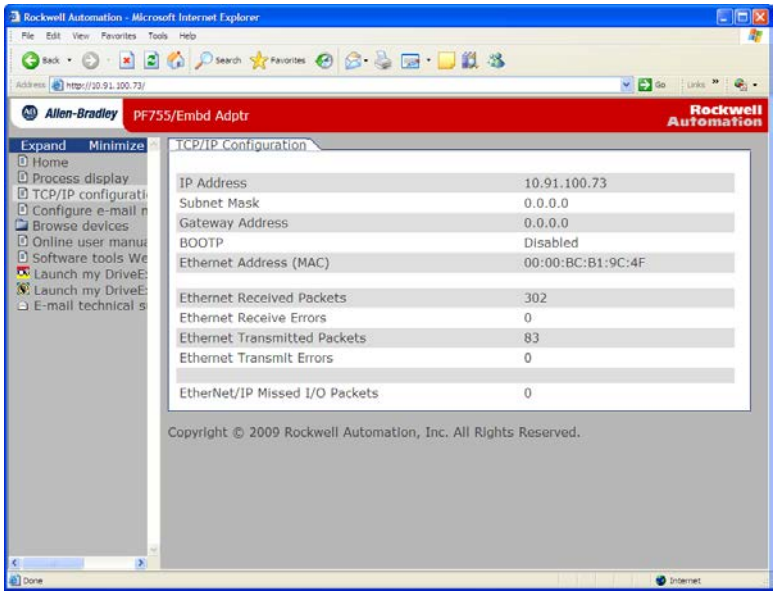


Information	Description
Product Text	Description of host drive.
Status	Status of host drive.
Commanded Direction	Commanded direction of host drive.
Rotation Direction	Rotation direction of host drive.
Process Status	
1st Line	Dynamic value of the host drive feedback parameter. This parameter is not selectable.
Lines 2 through 7	Dynamic value of each default-displayed host drive parameter. The displayed drive parameters for lines 2 through 7 are selectable using a HIM, or another drive configuration tool such as Connected Components Workbench, DriveExecutive, or DriveExplorer software.

TCP/IP Configuration Web Page

The TCP/IP Configuration web page provides information about the adapter's Ethernet settings and network activities. To view this web page, click the 'TCP/IP configuration' link (highlighted in Figure 34) in the navigation pane.

Figure 34 - Example of TCP/IP Configuration Web Page

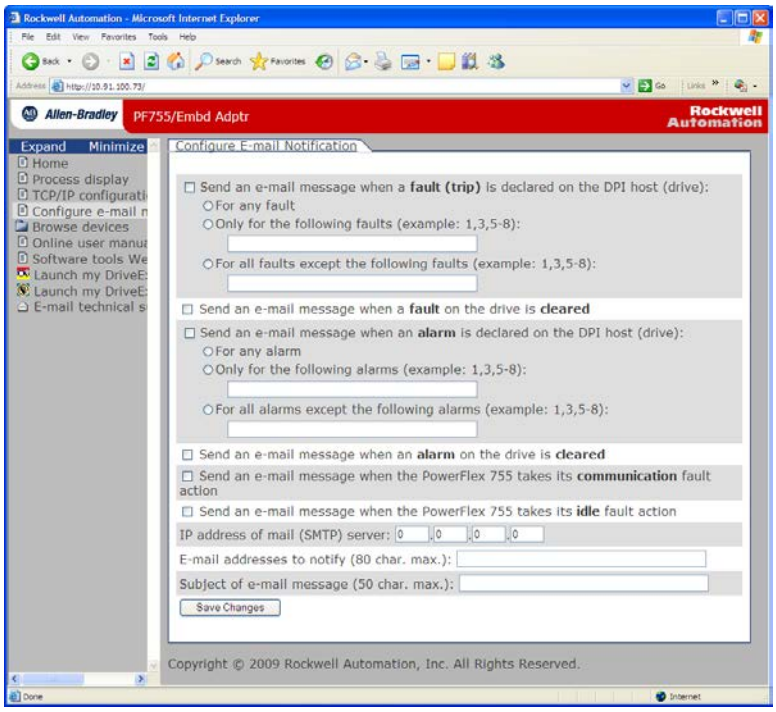


Information	Description
IP Address	IP address of the adapter.
Subnet Mask	Subnet mask for the adapter's network.
Gateway Address	Address for the gateway device on the adapter's network.
BOOTP	Shows status for BOOTP, which may be used to configure the adapter's network information.
Ethernet Address (MAC)	Hardware address for the adapter.
Ethernet Received Packets	Number of packets that the adapter has received.
Ethernet Receive Errors	Number of receive errors reported by the hardware.
Ethernet Transmitted Packets	Number of packets that the adapter has sent.
Ethernet Transmit Errors	Number of transmit errors reported by the hardware.
EtherNet/IP Missed I/O Packets	Number of I/O connection packets that the adapter did not receive.

Configure E-mail Notification Web Page

The Configure E-mail Notification web page contains selections and data fields for configuring the adapter to automatically send email messages to desired addresses when selected types of events occur. To view this web page, click the 'Configure e-mail...' link (highlighted in Figure 35) in the navigation pane.

Figure 35 - Example of Configure E-mail Notification Web Page


Rockwell Automation - Microsoft Internet Explorer
Allen-Bradley
PF755/Embd Adptr
Rockwell Automation
Expand
Minimize
Home
Process display
Browse devices
Configure E-mail Notification
Send an e-mail message when a fault (trip) is declared on the DPI host (drive):
For any fault
Only for the following faults (example: 1,3,5-8):
For all faults except the following faults (example: 1,3,5-8):
Send an e-mail message when a fault on the drive is cleared
Send an e-mail message when an alarm is declared on the DPI host (drive):
For any alarm
Only for the following alarms (example: 1,3,5-8):
For all alarms except the following alarms (example: 1,3,5-8):
Send an e-mail message when an alarm on the drive is cleared
Send an e-mail message when the PowerFlex 755 takes its communication fault action
Send an e-mail message when the PowerFlex 755 takes its idle fault action
IP address of mail (SMTP) server:
E-mail addresses to notify (80 char. max.):
Subject of e-mail message (50 char. max.):
Save Changes
Copyright © 2009 Rockwell Automation, Inc. All Rights Reserved.

By default, settings are not protected. After configuration, settings can be protected by using **Parameter 53 - [Web Features]** to set E-mail Cfg Bit 0 value to '0' (Disabled). To change a protected configuration, it must first be unprotected by setting the E-mail Cfg Bit 0 value back to '1' (Enabled).

To configure email notification, perform the following steps.

1. Click the desired check boxes corresponding to what you want to occur that will send email notification.
   - If you only want email notification when specific faults or alarms occur, click this radio button and enter the fault or alarm numbers in the box.
   - If you only want email notification when all faults or alarms except specific faults or alarms occur, click this radio button and enter the fault or alarm numbers in the box.
2. Click the communication fault and/or idle fault check box if you want email notification when these faults occur.

3. Type the following information in their respective boxes.

Information	Description
'IP address of…'	Type in the address of the mail server that will be used to deliver the email messages. (When the IP address is unknown, read the TIP shown below this table to determine the mail server address.)
'E-mail addresses to notify…'	Type in addresses to where you want email messages to be sent. Multiple addresses can be used, but they must be separated by commas (comma delimited).
'Subject of e-mail message…'	Type in the desired subject text for the email message.

TIP If the IP address of the email server is unknown, you can contact your IT department or use the following DOS command instructions to find its IP address.

a. From the Start menu On the Windows task bar, choose Run to display the Run dialog box.

b. In the Run dialog box Open field, type 'cmd'.

c. Click OK to display the DOS dialog box.

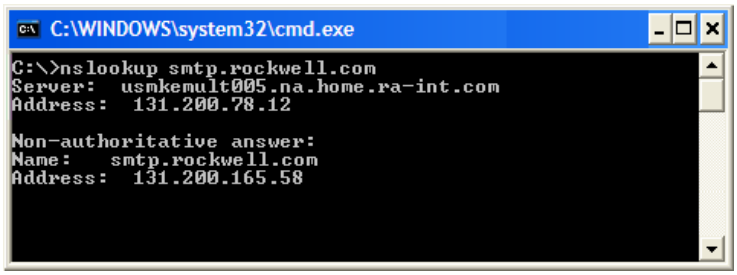
d. On the c:\ > command line, type 'nslookup [name of email server]'.

The entry 'c:\ > nslookup smtp.company.com' is an example.

e. Press Enter to display the email server IP address (Figure 36).

f. Type the second (bottom) IP address shown in the DOS dialog box (for this example, 131.200.165.58) into the E-mail Notification web page (Figure 35).

Figure 36 - DOS Dialog Box Example Showing Email Server IP Address

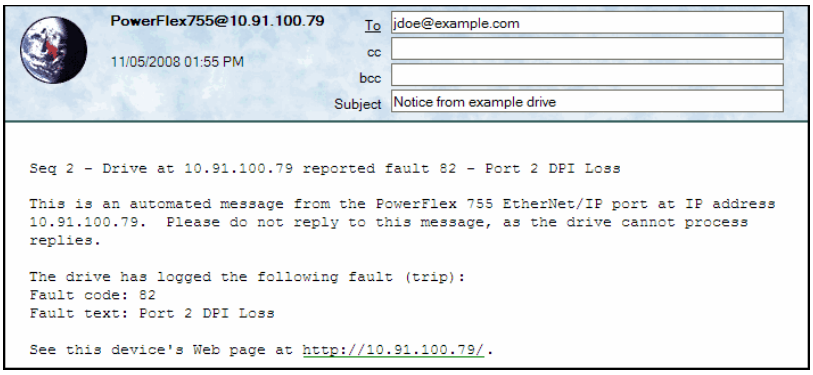


4. Click Save Changes.

IMPORTANT After configuring E-mail Notification, it is recommended to protect the settings. Otherwise the configuration can be changed anytime the web page is accessed with a browser. To protect the settings, use **Parameter 53 - [Web Features]** to set E-mail Cfg Bit 0 value to '0' (Disabled).

Figure 37 shows an example email message automatically sent by the adapter in response to selected events.

Figure 37 - Example of Email Message Sent by the Adapter


PowerFlex755@10.91.100.79
11/05/2008 01:55 PM
To
jdoe@example.com
cc
bcc
Subject
Notice from example drive
Seq 2 - Drive at 10.91.100.79 reported fault 82 - Port 2 DPI Loss
This is an automated message from the PowerFlex 755 EtherNet/IP port at IP address 10.91.100.79. Please do not reply to this message, as the drive cannot process replies.
The drive has logged the following fault (trip):
Fault code: 82
Fault text: Port 2 DPI Loss
See this device's Web page at http://10.91.100.79/.

TIP To stop email messages, uncheck all of the 'Send an e-mail message when…' boxes.

Disabling the adapter web pages by setting **Parameter 52 - [Web Enable]** to '0' (Disabled) will **not stop** the adapter from sending email messages.

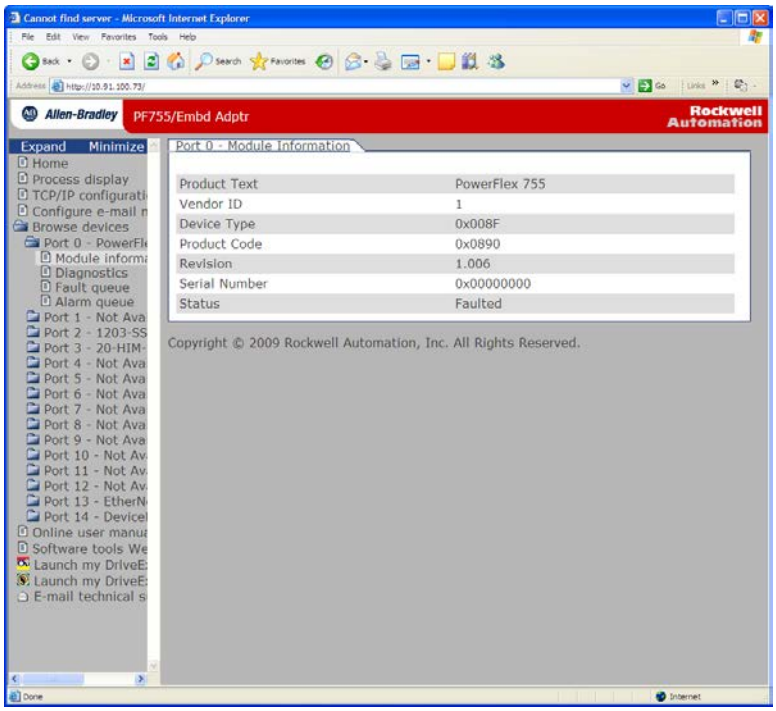
Device Information Pages

Device information pages are viewed by clicking on the respective links in the navigation pane:

Web Page	Description
Module Information	Shows module information for the respective drive Port device. For example, Figure 38 shows module information for the Port 0 device (host drive).
Diagnostics	Shows diagnostic item information for the respective drive Port device. For example, Figure 39 shows diagnostic items for the Port 0 device (host drive).
Fault Queue	Shows fault queue information for the respective drive Port device. For example, Figure 40 shows the fault queue for the Port 0 device (host drive).
Alarm Queue	Shows alarm queue information for the respective drive Port device. For example, Figure 41 shows the alarm queue for the Port 0 device (host drive).
Event Queue (1)	Shows event queue information for the respective drive Port device. For example, Figure 42 shows the event queue for the Port 13 device (embedded EtherNet/IP adapter).

(1) Information shown only when supported by the device.

Figure 38 - Example of Port 0 (PowerFlex 755 Drive) Module Information Page



Information	Description
Product Text	Text identifying the device
Vendor ID	1 = Allen-Bradley
Device Type	0x008F (143 decimal) = PowerFlex 755 drive
Product Code	Code for the product name and its rating
Revision	Firmware revision used by the device
Serial Number	Serial number of the device
Status	Operating status of the device (for example, faulted)

Figure 39 - Example of Port 0 (PowerFlex 755 Drive) Diagnostic Items Page

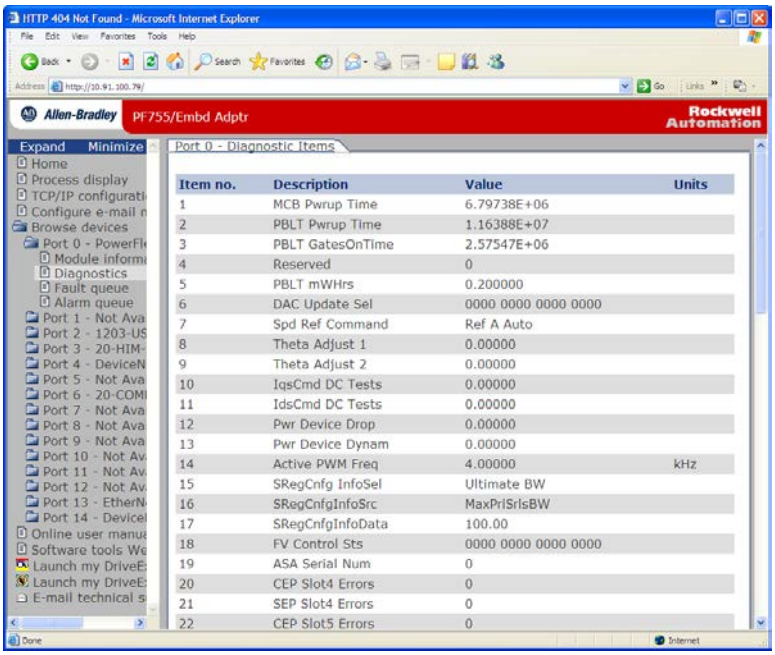

HTTP 404 Not Found - Microsoft Internet Explorer
Allen-Bradley
PF755/Embd Adptr
Rockwell Automation
Expand
Minimize
Port 0 - Diagnostic Items
Item no.
Description
Value
Units
1 MCB Pwrup Time 6.79738E+06
2 PBLT Pwrup Time 1.16388E+07
3 PBLT GatesOnTime 2.57547E+06
4 Reserved 0
5 PBLT mWHrs 0.200000
6 DAC Update Sel 0000 0000 0000 0000
7 Spd Ref Command Ref A Auto
8 Theta Adjust 1 0.00000
9 Theta Adjust 2 0.00000
10 IqsCmd DC Tests 0.00000
11 IdsCmd DC Tests 0.00000
12 Pwr Device Drop 0.00000
13 Pwr Device Dynam 0.00000
14 Active PWM Freq 4.00000 kHz
15 SRegCnfg InfoSel Ultimate BW
16 SRegCnfgInfoSrc MaxPriSrlsBW
17 SRegCnfgInfoData 100.00
18 FV Control Sts 0000 0000 0000 0000
19 ASA Serial Num 0
20 CEP Slot4 Errors 0
21 SEP Slot4 Errors 0
22 CEP Slot5 Errors 0

Figure 40 - Example of Port 0 (PowerFlex 755 Drive) Fault Queue Page

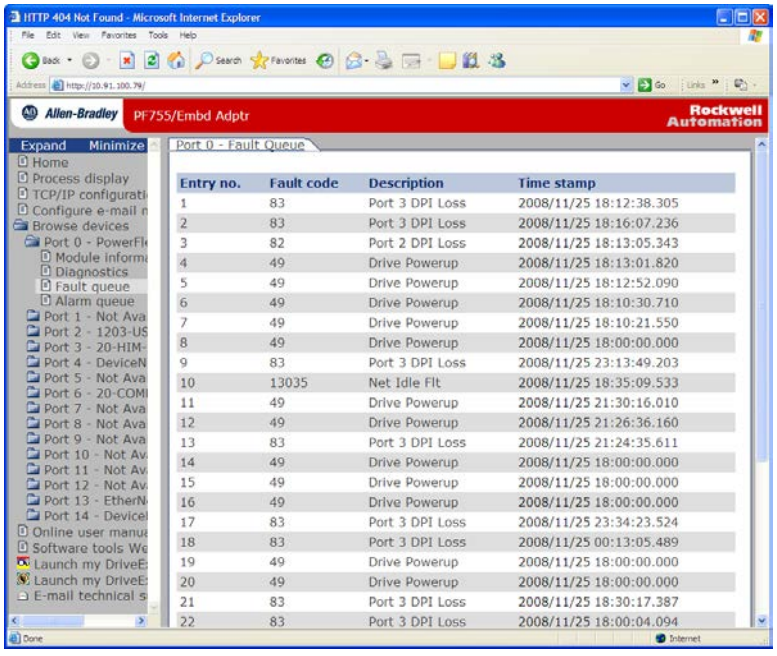


Figure 41 - Example of Port 0 (PowerFlex 755 Drive) Alarm Queue Page

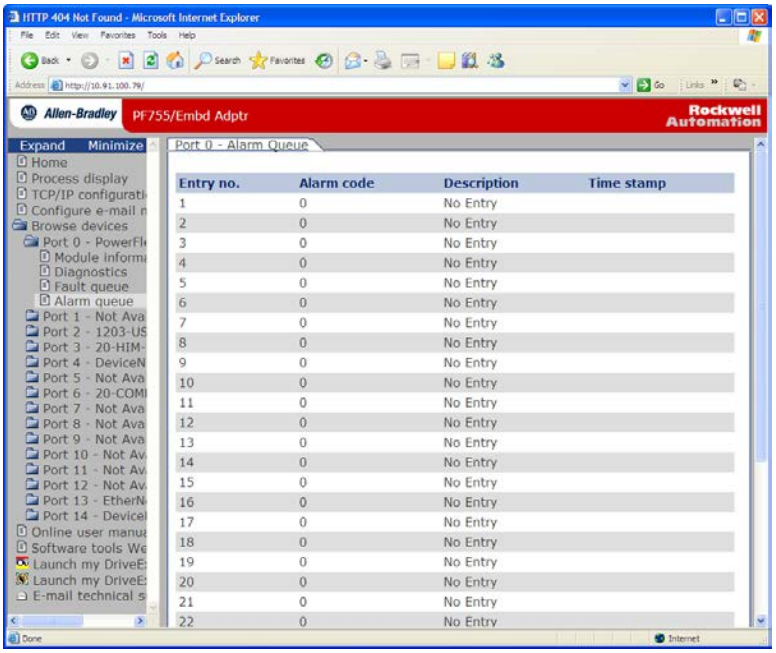
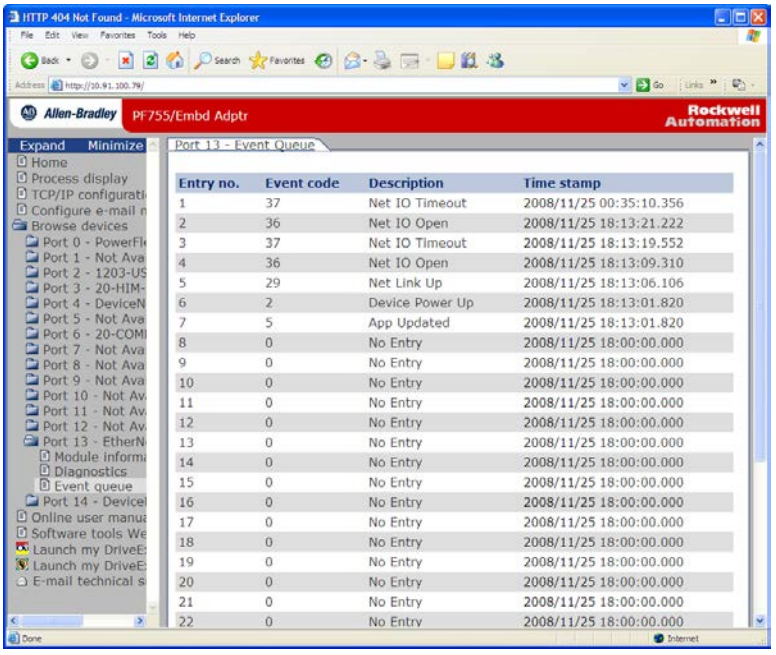


Figure 42 shows an example event queue page for the Port 13 device (embedded EtherNet/IP adapter).

Figure 42 - Example of Port 13 (Embedded EtherNet/IP Adapter) Event Queue Page



Notes:

Specifications

This appendix presents the specifications for the adapter.

Communications

Network	
Protocol	EtherNet/IP
Data Rates	10 Mbps Full Duplex, 10 Mbps Half Duplex, 100 Mbps Full Duplex, or 100 Mbps Half Duplex
Connection Limits	30 TCP connections 16 simultaneous CIP connections including 1 exclusive-owner I/O connection The following activities use a CIP connection: • Class I I/O connections (for example, from a ControlLogix controller) or 'Integrated Motion on the EtherNet/IP network' connection • Explicit messaging where 'connected' is chosen (for example, in a check box in RSLogix 5000 software) • DriveExecutive connections to the drive The following activities **do not** use a CIP connection: • Explicit messaging-based control using PCCC or the Register or Assembly objects • Explicit messaging where 'connected' is **not** chosen, which is typically the default • DriveExplorer software connections to the drive
Requested Packet Interval (RPI)	2 ms minimum
'Integrated Motion on the EtherNet/IP network' Coarse Update Rate	2 ms minimum
Packet Rate	Up to 400 total I/O packets per second (200 in and 200 out)
Drive	
Protocol	DPI
Data Rate	500 Kbps

Regulatory Compliance

UL	UL508C
cUL	CAN / CSA C22.2 No. 14-M91
CE	EN50178 and EN61800-3
CTick	EN61800-3

NOTE: This is a product of category C2 according to IEC 61800-3. In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

Notes:

Adapter Parameters

This appendix provides information about the adapter parameters.

Topic	Page
How Parameters Are Organized	127
Parameter List	128

How Parameters Are Organized

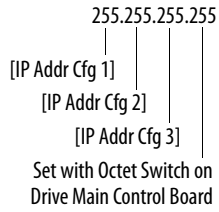
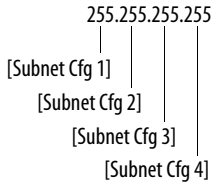
The embedded EtherNet/IP adapter parameters are numbered consecutively and displayed in a **Numbered List** view order.

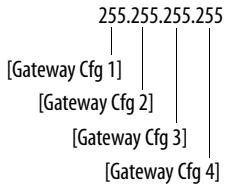
You can view the adapter parameters with any of the following drive configuration tools:

- PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM—use the 4 or 6 key to scroll to drive Port 13 (the adapter), press the (Folders) key, and use the 4 or 6 key to scroll to the PARAM folder.
- Connected Components Workbench software—click the tab for the embedded EtherNet/IP adapter at the bottom of the window, click the Parameters icon in the tool bar, and click the Parameters tab.
- DriveExplorer software—find the embedded EtherNet/IP adapter in the treeview and open its Parameters folder.
- DriveExecutive software—find the embedded EtherNet/IP adapter in the treeview, expand the adapter in the tree, and open its Parameters folder.

Parameter List

Parameter No.	Name and Description	Details	
01	**[DL From Net 01]**	Default:	0
02	**[DL From Net 02]**	Default:	0
03	**[DL From Net 03]**	Default:	0
04	**[DL From Net 04]**	Default:	0
05	**[DL From Net 05]**	Default:	0
06	**[DL From Net 06]**	Default:	0
07	**[DL From Net 07]**	Default:	0
08	**[DL From Net 08]**	Default:	0
09	**[DL From Net 09]**	Default:	0
10	**[DL From Net 10]**	Default:	0
11	**[DL From Net 11]**	Default:	0
12	**[DL From Net 12]**	Default:	0
13	**[DL From Net 13]**	Default:	0
14	**[DL From Net 14]**	Default:	0
15	**[DL From Net 15]**	Default:	0
16	**[DL From Net 16]** Sets the port number and parameter number to which the selected Datalinks should connect. Each selected port/parameter will be written with data received from the network. These are parameters written by the controller (outputs from the controller). If setting the value manually, the parameter value = (10000 * port number) + (destination parameter number). For example, suppose you want to use **Parameter 01 - [DL From Net 01]** to write to Parameter 01 of an optional encoder card plugged into drive Port 5. The value for **Parameter 01 - [DL From Net 01]** would be 50001 [(10000 * 5) + 1].	Default: Minimum: Maximum: Type: Reset Required:	0 0 159999 Read/Write No
17	**[DL To Net 01]**	Default:	0
18	**[DL To Net 02]**	Default:	0
19	**[DL To Net 03]**	Default:	0
20	**[DL To Net 04]**	Default:	0
21	**[DL To Net 05]**	Default:	0
22	**[DL To Net 06]**	Default:	0
23	**[DL To Net 07]**	Default:	0
24	**[DL To Net 08]**	Default:	0
25	**[DL To Net 09]**	Default:	0
26	**[DL To Net 10]**	Default:	0
27	**[DL To Net 11]**	Default:	0
28	**[DL To Net 12]**	Default:	0
29	**[DL To Net 13]**	Default:	0
30	**[DL To Net 14]**	Default:	0
31	**[DL To Net 15]**	Default:	0
32	**[DL To Net 16]** Sets the port number and parameter number to which the selected Datalinks should connect. Each selected port/parameter will be read and their values transmitted over the network to the controller. These are parameters read by the controller (inputs to the controller). If setting the value manually, the parameter value = (10000 * port number) + (origination parameter number). For example, suppose you want to use **Parameter 17 - [DL To Net 01]** to read Parameter 02 of an optional I/O card plugged into drive Port 6. The value for **Parameter 17 - [DL To Net 01]** would be 60002 [(10000 * 6) + 2].	Default: Minimum: Maximum: Type: Reset Required:	0 0 159999 Read/Write No
33	**[Port Number]** Displays the drive port to which the embedded EtherNet/IP adapter is dedicated. This is always Port 13.	Value: Type:	13 Read Only
34	**[DLs From Net Act]** Displays the number of controller-to-drive Datalinks that the drive is using based on the I/O connection opened by the controller.	Minimum: Maximum: Type:	0 16 Read Only

Parameter No.	Name and Description	Details
35	**[DLs To Net Act]** Displays the number of drive-to-controller Datalinks that the controller is using based on the I/O connection opened by the controller.	Minimum: 0 Maximum: 16 Type: Read Only
36	**[BOOTP]** Configures the adapter to use BOOTP so that you can set its IP address, subnet mask, and gateway address with a BOOTP server. When this parameter is disabled, you must use either the adapter IP Address switches (Figure 1 on page 19) or the adapter parameters to set these addressing functions.	Default: 1 = Enabled Values: 0 = Disabled 1 = Enabled Type: Read/Write Reset Required: Yes
37	**[Net Addr Src]** Displays the source from which the adapter's node address is taken.	Values: 0 = Switches 1 = Parameters 2 = BOOTP Type: Read Only
38 39 40 41	**[IP Addr Cfg 1]** **[IP Addr Cfg 2]** **[IP Addr Cfg 3]** **[IP Addr Cfg 4]** Sets the IP address bytes for the adapter's network address when **Parameter 36 - [BOOTP]** is set to '0' (Disabled), and the IP Address switches (Figure 1 on page 19) are not being used (that is, switches set to any value other than 001...254 or 888).  	Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes
42 43 44 45	**[Subnet Cfg 1]** **[Subnet Cfg 2]** **[Subnet Cfg 3]** **[Subnet Cfg 4]** Sets the subnet mask bytes for the adapter's network address when **Parameter 36 - [BOOTP]** is set to '0' (Disabled), and the IP Address switches (Figure 1 on page 19) are not being used (that is, switches set to any value other than 001...254 or 888).  	Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes

Parameter No.	Name and Description	Details
46 47 48 49	**[Gateway Cfg 1]** **[Gateway Cfg 2]** **[Gateway Cfg 3]** **[Gateway Cfg 4]** Sets the gateway address bytes for the adapter's network address when **Parameter 36 - [BOOTP]** is set to '0' (Disabled), and the IP Address switches (Figure 1 on page 19) are not being used (that is, switches set to any value other than 001…254 or 888).  	Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes
50	**[Net Rate Cfg]** Sets the speed and duplex network data rate at which the adapter communicates. (Updates **Parameter 51 - [Net Rate Act]** after a reset.)	Default: 0 = Autodetect Values: 0 = Autodetect 1 = 10 Mbps Full 2 = 10 Mbps Half 3 = 100 Mbps Full 4 = 100 Mbps Half Type: Read/Write Reset Required: Yes
51	**[Net Rate Act]** Displays the actual speed and duplex network data rate used by the adapter.	Values: 0 = No Link 1 = 10 Mbps Full 2 = 10 Mbps Half 3 = 100 Mbps Full 4 = 100 Mbps Half 5 = Dup IP Addr Type: Read Only
52	**[Web Enable]** Enables/disables the adapter's web pages.	Default: 0 = Disabled Values: 0 = Disabled 1 = Enabled Type: Read/Write Reset Required: Yes
53	**[Web Features]** Enables/disables the web-configurable email notification feature. Bit Definition: Not Used (15), Not Used (14), Not Used (13), Not Used (12), … Not Used (7), Not Used (6), Not Used (5), Not Used (4), Not Used (3), Not Used (2), Not Used (1), E-mail Cfg (0) Default: x x x x … x x x x x x x 1 Bit: 15 14 13 12 … 7 6 5 4 3 2 1 0	Default: xxxx xxxx xxxx xxx1 Bit Values: 0 = Disabled 1 = Enabled Type: Read/Write Reset Required: No

Parameter No.	Name and Description	Details
54	**[Comm Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that I/O communication has been disrupted. This setting is effective only if I/O that controls the drive is transmitted through the adapter. When communication is re-established, the drive will automatically receive commands over the network again.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 54 - [Comm Flt Action]** lets you determine the action of the adapter and connected drive if I/O communication is disrupted. By default, this parameter faults the drive. You may configure this parameter so that the drive continues to run, however, precautions should be taken to verify that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).	
55	**[Idle Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that the controller is in program mode or faulted. This setting is effective only if I/O that controls the drive is transmitted through the adapter. When the controller is put back in Run mode, the drive will automatically receive commands over the network again.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 55 - [Idle Flt Action]** lets you determine the action of the adapter and connected drive when the controller is idle. By default, this parameter faults the drive. You may configure this parameter so that the drive continues to run, however, precautions should be taken to verify that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a controller in idle state).	

Parameter No.	Name and Description	Details
56	**[Peer Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that peer I/O communication has been disrupted. This setting is effective only if I/O is transmitted through the adapter. When peer I/O communication is re-established, the drive will automatically receive commands over the network again.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No

ATTENTION: Risk of injury or equipment damage exists. **Parameter 56 - [Peer Flt Action]** lets you determine the action of the adapter and connected drive if the adapter is unable to communicate with the designated peer. By default, this parameter faults the drive. You may configure this parameter so that the drive continues to run, however, precautions should be taken to verify that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

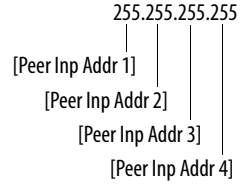
57	**[Msg Flt Action]** Sets the action that the adapter and drive will take if the adapter detects that explicit messaging—only when used for drive control via PCCC or the CIP Register Object—has been disrupted. When explicit messaging is re-established, data is automatically received/sent over the network again.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No

ATTENTION: Risk of injury or equipment damage exists. **Parameter 57 - [Msg Flt Action]** lets you determine the action of the adapter and connected drive if explicit messaging for drive control is disrupted. By default, this parameter faults the drive. You may configure this parameter so that the drive continues to run, however, precautions should be taken to verify that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

58	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if any of the following is true: • **Parameter 54 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. • **Parameter 55 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. • **Parameter 56 - [Peer Flt Action]** is set to '4' (Send Flt Cfg) and peer I/O communication is disrupted. • **Parameter 57 - [Msg Flt Action]** is set to '4' (Send Flt Cfg) and explicit messaging for drive control is disrupted. **Important:** The bit definitions in the Logic Command word for PowerFlex 750-Series drives are shown in Appendix D.	Default: 0000 0000 0000 0000 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 1111 1111 1111 1111 Type: Read/Write Reset Required: No

Parameter No.	Name and Description	Details
59	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if any of the following is true: • **Parameter 54 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. • **Parameter 55 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. • **Parameter 56- [Peer Flt Action]** is set to '4' (Send Flt Cfg) and peer I/O communication is disrupted. • **Parameter 57 - [Msg Flt Action]** is set to '4' (Send Flt Cfg) and explicit messaging for drive control is disrupted.	Default: 0 Minimum: -3.40282×10^{38} Maximum: 3.40282×10^{38} Type: Read/Write Reset Required: No
60	**[Flt Cfg DL 01]**	Default: 0
61	**[Flt Cfg DL 02]**	Default: 0
62	**[Flt Cfg DL 03]**	Default: 0
63	**[Flt Cfg DL 04]**	Default: 0
64	**[Flt Cfg DL 05]**	Default: 0
65	**[Flt Cfg DL 06]**	Default: 0
66	**[Flt Cfg DL 07]**	Default: 0
67	**[Flt Cfg DL 08]**	Default: 0
68	**[Flt Cfg DL 09]**	Default: 0
69	**[Flt Cfg DL 10]**	Default: 0
70	**[Flt Cfg DL 11]**	Default: 0
71	**[Flt Cfg DL 12]**	Default: 0
72	**[Flt Cfg DL 13]**	Default: 0
73	**[Flt Cfg DL 14]**	Default: 0
74	**[Flt Cfg DL 15]**	Default: 0
75	**[Flt Cfg DL 16]** Sets the data that is sent to the Datalink in the drive if any of the following is true: • **Parameter 54 - [Comm Flt Action]** is set to '4' (Send Flt Cfg) and I/O communication is disrupted. • **Parameter 55 - [Idle Flt Action]** is set to '4' (Send Flt Cfg) and the controller is idle. • **Parameter 56 - [Peer Flt Action]** is set to '4' (Send Flt Cfg) and peer I/O communication is disrupted. • **Parameter 57 - [Msg Flt Action]** is set to '4' (Send Flt Cfg) and explicit messaging for drive control is disrupted.	Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No
76	**[DLs Fr Peer Cfg]** Sets the number of peer-to-drive Datalinks (parameters) that are used for peer I/O. The Datalinks being used are allocated from the end of the list. For example, if this parameter's value is set to '3', Datalinks 14…16 are allocated for the 3 selected Datalinks. The Datalinks allocated for peer I/O cannot overlap with other assigned DL From Net 01-16 parameters. **NOTE:** The adapter allows the peer input configuration parameters to be written while peer inputs are running. However, the changes will not take effect until peer inputs are disabled and then re-enabled, or until the adapter is power cycled or reset.	Default: 0 Minimum: 0 Maximum: 16 Type: Read/Write Reset Required: Yes
77	**[DLs Fr Peer Act]** Displays the value of **Parameter 76 - [DLs Fr Peer Cfg]** at the time the adapter/drive was reset. This is the number of actual peer-to-drive Datalinks that the drive is expecting.	Minimum: 0 Maximum: 16 Type: Read Only

Parameter No.	Name and Description	Details
78	**[Logic Src Cfg]** Controls which of the peer-to-drive Datalinks contain the Logic Command for the drive. The value zero specifies that none of the Datalinks contain the drive's Logic Command. Non-zero values specify the 'index' for the Datalink containing the drive's Logic Command. For example, if **Parameter 76 - [DLs Fr Peer Cfg]** has the value 3 specifying that Datalinks 14…16 are allocated for peer I/O and **Parameter 78 - [Logic Src Cfg]** has the value 1 specifying that the first peer I/O Datalink contains the drive's Logic Command, then Datalink 14 contains the drive's Logic Command. **NOTE:** The adapter allows the peer input configuration parameters to be written while peer inputs are running. However, the changes will not take effect until peer inputs are disabled and then re-enabled, or until the adapter is power cycled or reset.	Default: 0 Minimum: 0 Maximum: 16 Type: Read/Write Reset Required: No
79	**[Ref Src Cfg]** Controls which of the peer-to-drive Datalinks contain the Reference for the drive. The value zero specifies that none of the Datalinks contain the drive's Reference. Non-zero values specify the 'index' for the Datalink containing the drive's Reference. For example, if **Parameter 76 - [DLs Fr Peer Cfg]** has the value 3 specifying that Datalinks 14…16 are allocated for peer I/O and **Parameter 79 - [Ref Src Cfg]** has the value 1 specifying that the first peer I/O Datalink contains the drive's Reference, then Datalink 14 contains the drive's Reference. **NOTE:** The adapter allows the peer input configuration parameters to be written while peer inputs are running. However, the changes will not take effect until peer inputs are disabled and then re-enabled, or until the adapter is power cycled or reset.	Default: 0 Minimum: 0 Maximum: 16 Type: Read/Write Reset Required: No
80	**[Fr Peer Timeout]** Sets the timeout for a peer I/O connection. If the time is reached without the adapter receiving (consuming) a message, the adapter will respond with the action specified in **Parameter 56 - [Peer Flt Action]**. In an adapter receiving (consuming) peer I/O, the value of this parameter must be greater than the product of the value of **Parameter 89 - [To Peer Period]** in the adapter transmitting (producing) peer I/O multiplied by the value of **Parameter 90 - [To Peer Skip]** in the adapter transmitting (producing) peer I/O. **NOTE:** The adapter allows the peer input configuration parameters to be written while peer inputs are running. However, the changes will not take effect until peer inputs are disabled and then re-enabled, or until the adapter is power cycled or reset.	Default: 10.00 Seconds Minimum: 0.01 Seconds Maximum: 10.00 Seconds Type: Read/Write Reset Required: No

Parameter No.	Name and Description	Details
81 82 83 84	**[Fr Peer Addr 1]** **[Fr Peer Addr 2]** **[Fr Peer Addr 3]** **[Fr Peer Addr 4]** Sets the IP address bytes that specifies the device from which the adapter receives (consumes) peer I/O data.  **Important:** The Fr Peer Addr must be on the same subnet as the embedded EtherNet/IP adapter. See IP Addresses on page 180 for more information. Changes to these parameters are ignored when **Parameter 85 - [Fr Peer Enable]** is '1' (On).	Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: No
85	**[Fr Peer Enable]** Controls whether peer I/O input is operating. A value of '0' (Off) turns off peer I/O input. A value of '1' (Cmd/Ref) overrides the settings in **Parameters 76 - [DLs Fr Peer Cfg], 78 - [Logic Src Cfg],** and **79 - [Ref Src Cfg]** and automatically uses peer Datalink 01 as the drive's present Logic Command and peer Datalink 02 as the drive's Reference. A value of '2' (Custom) enables peer I/O input using the Datalink count and settings provided by the user. If the value of this parameter is changed from '1' (Cmd/Ref) to '2' (Custom) or from '2' (Custom) to '1' (Cmd/Ref) while peer I/O is running, the drive will be commanded to do its Peer Fault Action before the peer input mode is changed.	Default: 0 = Off Values: 0 = Off 1 = Cmd/Ref 2 = Custom Type: Read/Write Reset Required: No
86	**[Fr Peer Status]** Displays the status of the consumed peer I/O input connection.	Values: 0 = Off 1 = Waiting 2 = Running 3 = Faulted Type: Read Only
87	**[DLs To Peer Cfg]** Sets the number of drive-to-peer Datalinks (parameters) that are used for peer I/O. The Datalinks being used are allocated from the end of the list. For example, if this parameter's value is set to '3', Datalinks 14…16 are allocated for the 3 selected Datalinks. The Datalinks allocated for this cannot overlap with other assigned DL To Net 01-16 parameters. **NOTE:** The adapter allows the peer output configuration parameters to be written while peer outputs are running. However, the changes will not take effect until peer outputs are disabled and then re-enabled, or until the adapter is power cycled or reset.	Default: 0 Minimum: 0 Maximum: 16 Type: Read/Write Reset Required: Yes
88	**[DLs To Peer Act]** Displays the value of **Parameter 87 - [DLs To Peer Cfg]** at the time the drive was reset. This is the number of actual drive-to-peer Datalinks that the drive is expecting.	Minimum: 0 Maximum: 16 Type: Read Only
89	**[To Peer Period]** Sets the minimum time that an adapter will wait when transmitting data to a peer. **Important:** Changes to this parameter are ignored when **Parameter 91 - [To Peer Enable]** is '1' (On).	Default: 10.00 Seconds Minimum: 0.01 Seconds Maximum: 10.00 Seconds Type: Read/Write Reset Required: No

Parameter No.	Name and Description	Details
90	**[To Peer Skip]** Sets the maximum time that an adapter will wait when transmitting data to a peer. The value of **Parameter 89 - [To Peer Period]** is multiplied by the value of this parameter to set the time. **Important:** Changes to this parameter are ignored when **Parameter 91 - [To Peer Enable]** is '1' (On).	Default: 1 Minimum: 1 Maximum: 16 Type: Read/Write Reset Required: No
91	**[To Peer Enable]** Controls whether peer I/O output is operating. A value of '0' (Off) turns off peer I/O output. A value of '1' (Cmd/Ref) overrides the settings in **Parameters 31 - [DL To Net 15], 32 - [DL To Net 16], 76 - [DLs Fr Peer Cfg], and 77 - [DLs Fr Peer Act]**, and automatically sends the drive's present Logic Command (as Datalink 01) and Reference (as Datalink 02). A value of '2' (Custom) enables peer I/O output using the Datalink count and settings provided by the user.	Default: 0 = Off Values: 0 = Off 1 = Cmd/Ref 2 = Custom Type: Read/Write Reset Required: No

EtherNet/IP Objects

This appendix presents information about the EtherNet/IP objects that can be accessed using Explicit Messages. For information on the format of Explicit Messages and example ladder logic programs, see Chapter 6, Using Explicit Messaging.

Object	Class Code		Page
	Hex.	Dec.	
Identity Object	0x01	1	138
Assembly Object	0x04	4	139
Register Object	0x07	7	140
PCCC Object	0x67	103	141
DPI Device Object	0x92	146	145
DPI Parameter Object	0x93	147	148
DPI Fault Object	0x97	151	154

Object	Class Code		Page
	Hex.	Dec.	
DPI Alarm Object	0x98	152	156
DPI Diagnostic Object	0x99	153	158
DPI Time Object	0x9B	155	160
Host DPI Parameter Object	0x9F	159	162
TCP/IP Interface Object	0xF5	245	168
Ethernet Link Object	0xF6	246	170

TIP See the EtherNet/IP specification for more information about EtherNet/IP objects. Information about the EtherNet/IP specification is available on the ODVA website (http://www.odva.org).

Supported Data Types

Data Type	Description
BOOL	8-bit value -- low bit is true or false
BOOL[x]	Array of n bits
CONTAINER	32-bit parameter value - sign extended if necessary
DINT	32-bit signed integer
INT	16-bit signed integer
LWORD	64-bit unsigned integer
REAL	32-bit floating point
SHORT_STRING	Struct of: USINT length indicator (L); USINT[L] characters
SINT	8-bit signed integer
STRINGN	Struct of: UINT character length indicator (W); UINT length indicator (L); USINT[W x L] string data
STRING[x]	Array of n characters
STRUCT	Structure name only - no size in addition to elements
TCHAR	8 or 16-bit character
UDINT	32-bit unsigned integer
UINT	16-bit unsigned integer
USINT	8-bit unsigned integer

Identity Object

Class Code

Hexadecimal	Decimal
0x01	1

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x05	No	Yes	Reset
0x0E	Yes	Yes	Get_Attribute_Single
0x01	Yes	Yes	Get_Attributes_All

Instances

The number of instances depends on the number of components in the device connected to the adapter. This number of components can be read in Instance 0, Attribute 2.

Instance	Description
0	Class
1	Host
2…15	Peripherals on Ports 1…14

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
2	Get	Max Instance	UINT	Total number of instances

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Vendor ID	UINT	1 = Allen-Bradley
2	Get	Device Type	UINT	123
3	Get	Product Code	UINT	Number identifying product name and rating
4	Get	Revision: Major Minor	STRUCT of: USINT USINT	 Value varies Value varies
5	Get	Status	UINT	Bit 0 = Owned Bit 8 = Minor recoverable fault Bit 10 = Major recoverable fault
6	Get	Serial Number	UDINT	Unique 32-bit number
7	Get	Product Name	SHORT_STRING	Product name and rating

Assembly Object

Class Code

Hexadecimal	Decimal
0x04	4

Services

	Implemented for:		
Service Code	Class	Instance	Service Name
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

Instance	Description
1	All I/O data being read from the DPI device (read-only)
2	All I/O data written to the DPI device (read/write)

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	2
2	Get	Max Instance	UINT	2
100	Set	Control Timeout	UINT	Control timeout in seconds

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Number of Members	UINT	1
2	Get	Member List	ARRAY of STRUCT: UINT UINT Packed EPATH	 Size of member data Size of member path Member path
3	Conditional (1)	Data	Array of Bits	Data to be transferred
4	Get	Size	UINT	Size of assembly data in bits

(1) For instance 1, access rule for the data attribute is Get. For instance 2, it is Get/Set.

IMPORTANT Setting an assembly object attribute can be done only when the Control Timeout (class attribute 100) has been set to a non-zero value.

Register Object

Class Code

Hexadecimal	Decimal
0x07	7

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

Instance	Description
1	All I/O data being read from the embedded adapter (read-only)
2	All I/O data written to the embedded adapter (read/write)
3	Logic Status and Feedback data (read-only)
4	Logic Command and Reference data (read/write)
5	DL To Net 01 (input data from embedded adapter to scanner) (read only)
6	DL From Net 01 (output data from scanner to embedded adapter) (read/write)
⋮	⋮
35	DL To Net 16 (input data from embedded adapter to scanner) (read only)
36	DL From Net 16 (output data from scanner to embedded adapter) (read/write)
37	Logic Status and Feedback data (read-only)
38	Masked Logic Command (1) (read/write)
39	Logic Status data (read-only)
40	Logic Command data (read/write)
41	Feedback data (read-only)
42	Reference data (read/write)

(1) The mask command DWORD is set to the value of the first DWORD of the data where there are ones in the second DWORD of the data. Only the bits of the Logic Command that have the corresponding mask bit set are applied.

Class Attributes

Attribute ID	Access Rule	Description
1	Read	Revision
2	Read	Maximum Instance
3	Read	Number of Instances
100	Read/Write	Timeout

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Bad Flag	BOOL	If set to 1, then attribute 4 may contain invalid data. 0 = good 1 = bad
2	Get	Direction	BOOL	Direction of data transfer 0 = Producer Register (drive to network) 1 = Consumer Register (network to drive)
3	Get	Size	UINT	Size of register data in bits
4	Conditional (1)	Data	ARRAY of BITS	Data to be transferred

(1) For this attribute, the Access Rule is Get if Direction = 0. The Access Rule is Set if Direction = 1.

PCCC Object

Class Code

Hexadecimal	Decimal
0x67	103

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x4B	No	Yes	Execute_PCCC
0x4C	No	Yes	Execute_DH+

Instances

Supports Instance 1.

Class Attributes

Not supported.

Instance Attributes

Not supported.

Message Structure for Execute_PCCC

Request		
Name	**Data Type**	**Description**
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code. Not used for all CMDs.
PCCC_params	ARRAY of USINT	CMD/FNC specific parameters

Response		
Name	**Data Type**	**Description**
Length	USINT	Length of requestor ID
Vendor	UINT	Vendor number of requestor
Serial Number	UDINT	ASA serial number of requestor
Other	Product Specific	Identifier of user, task, etc. on the requestor
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as the request.
EXT_STS	USINT	Extended status. Not used for all CMDs.
PCCC_results	ARRAY of USINT	CMD/FNC specific result data

Message Structure for Execute_DH+

Request		
Name	**Data Type**	**Description**
DLink	UINT	Destination Link ID
DSta	USINT	Destination Station number
DUser	USINT	Destination 'User' number
SLink	UINT	Source Link ID
SSta	USINT	Source Station number
SUser	USINT	Source User number
CMD	USINT	Command byte
STS	USINT	0
TNSW	UINT	Transport word
FNC	USINT	Function code; not used for all CMDs
PCCC_params	ARRAY of USINT	CMD/FNC specific parameters

Response		
Name	**Data Type**	**Description**
DLink	UINT	Destination Link ID
DSta	USINT	Destination Station number
DUser	USINT	Destination 'User' number
SLink	UINT	Source Link ID
SSta	USINT	Source Station number
SUser	USINT	Source User number
CMD	USINT	Command byte
STS	USINT	Status byte
TNSW	UINT	Transport word. Same value as the request.
EXT_STS	USINT	Extended Status; not used for all CMDs
PCCC_results	ARRAY of USINT	CMD/FNC specific result data

The embedded EtherNet/IP adapter supports the following PCCC command types:

CMD	FNC	Description
0x06	0x03	Identify host and some status
0x0F	0x67	PLC-5 typed write
0x0F	0x68	PLC-5 typed read
0x0F	0x95	Encapsulate other protocol
0x0F	0xA2	SLC 500 protected typed read with 3 address fields
0x0F	0xAA	SLC 500 protected typed write with 3 address fields
0x0F	0xA1	SLC 500 protected typed read with 2 address fields
0x0F	0xA9	SLC 500 protected typed write with 2 address fields
0x0F	0x00	Word range read
0x0F	0x01	Word range write

For more information regarding PCCC commands, see the DF1 Protocol and Command Set Reference Manual, publication 1770-6.5.16.

N-Files

N-File	Description	
N42	This N-file lets you read and write some values configuring the port.	
N42:3	Time-out (read/write): Time (in seconds) allowed between messages to the N45 file. If the adapter does not receive a message in the specified time, it performs the fault action configured in its [Comm Flt Action] parameter. A valid setting is between 1 and 32767 seconds (5…20 seconds is recommended).	
N42:7	Adapter Port Number (read only): Drive Port 13 in which the adapter resides.	
N42:8	Peer Adapters (read only): Bit field of devices with peer messaging capabilities.	
N45	This N-file lets you read and write control I/O messages. You can write control I/O messages only when all of the following conditions are true: • The adapter is not receiving I/O from a scanner. For example, there is no scanner on the network, the scanner is in idle (program) mode, the scanner is faulted, or the adapter is not mapped to the scanner. • The adapter is not receiving Peer I/O from another adapter. • The value of N42:3 is set to a non-zero value.	
	Write	*Read*
N45:0	Logic Command (least significant)	Logic Status (least significant)
N45:1	Logic Command (most significant)	Logic Status (most significant)
N45:2	Reference (least significant)	Feedback (least significant)
N45:3	Reference (most significant)	Feedback (most significant)
N45:4	DL From Net 01 (least significant)	DL To Net 01 (least significant)
N45:5	DL From Net 01 (most significant)	DL To Net 01 (most significant)
N45:6	DL From Net 02 (least significant)	DL To Net 02 (least significant)
N45:7	DL From Net 02 (most significant)	DL To Net 02 (most significant)
N45:8	DL From Net 03 (least significant)	DL To Net 03 (least significant)
N45:9	DL From Net 03 (most significant)	DL To Net 03 (most significant)
N45:10	DL From Net 04 (least significant)	DL To Net 04 (least significant)
N45:11	DL From Net 04 (most significant)	DL To Net 04 (most significant)
N45:12	DL From Net 05 (least significant)	DL To Net 05 (least significant)
N45:13	DL From Net 05 (most significant)	DL To Net 05 (most significant)
N45:14	DL From Net 06 (least significant)	DL To Net 06 (least significant)
N45:15	DL From Net 06 (most significant)	DL To Net 06 (most significant)
N45:16	DL From Net 07 (least significant)	DL To Net 07 (least significant)
N45:17	DL From Net 07 (most significant)	DL To Net 07 (most significant)
N45:18	DL From Net 08 (least significant)	DL To Net 08 (least significant)
N45:19	DL From Net 08 (most significant)	DL To Net 08 (most significant)
N45:20	DL From Net 09 (least significant)	DL To Net 09 (least significant)
N45:21	DL From Net 09 (most significant)	DL To Net 09 (most significant)
N45:22	DL From Net 10 (least significant)	DL To Net 10 (least significant)
N45:23	DL From Net 10 (most significant)	DL To Net 10 (most significant)
N45:24	DL From Net 11 (least significant)	DL To Net 11 (least significant)
N45:25	DL From Net 11 (most significant)	DL To Net 11 (most significant)
N45:26	DL From Net 12 (least significant)	DL To Net 12 (least significant)
N45:27	DL From Net 12 (most significant)	DL To Net 12 (most significant)
N45:28	DL From Net 13 (least significant)	DL To Net 13 (least significant)
N45:29	DL From Net 13 (most significant)	DL To Net 13 (most significant)
N45:30	DL From Net 14 (least significant)	DL To Net 14 (least significant)
N45:31	DL From Net 14 (most significant)	DL To Net 14 (most significant)
N45:32	DL From Net 15 (least significant)	DL To Net 15 (least significant)
N45:33	DL From Net 15 (most significant)	DL To Net 15 (most significant)
N45:34	DL From Net 16 (least significant)	DL To Net 16 (least significant)
N45:35	DL From Net 16 (most significant)	DL To Net 16 (most significant)

N-File	Description
N150…N199	These N-files let you read and write parameter values in the PowerFlex 755 drive as 32-bit double words. You can interpret the data in various ways (for example, 32-bit real, 32-bit integer) To read a parameter, you need to send a message with two elements. For example, to read parameter 1, read two elements beginning at N150:2. As another example, to read parameters 2…6, read ten elements beginning at N150:4.
N150:0…1	Number of parameters in the drive
N150:2…249	Drive parameters 1…124
N151:0…249	Drive parameters 125…249
N152:0…249	Drive parameters 250…374
N153:0…249	Drive parameters 375…499
⋮	⋮
N199:0…249	Drive parameters 6125…6249
N201…N212	These N-files let you read and write parameter values in DPI Peripherals (for example, a HIM or adapter) as 32-bit double words. You can interpret the data in various ways (for example, 32-bit real, 32-bit integer) To read a parameter, you need to send a message with two elements. For example, to read parameter 1 in the peripheral connected to DPI port 1, read two elements beginning at N201:2. As another example, to read parameters 2…6 in the peripheral connected to DPI port 5 (the adapter), read ten elements beginning at N209:4.
N201:0…1	Number of parameters in the DPI peripheral at DPI port 1
N201:2…249	Parameters 1…124 in the DPI peripheral at DPI port 1
N202:0…249	Parameters 125…249 in the DPI peripheral at DPI port 1
N203:0…1	Number of parameters in the DPI peripheral at DPI port 2
N203:2…249	Parameters 1…124 in the DPI peripheral at DPI port 2
N204:0…249	Parameters 125…249 in the DPI peripheral at DPI port 2
N205:0…1	Number of parameters in the DPI peripheral at DPI port 3
N205:2…249	Parameters 1…124 in the DPI peripheral at DPI port 3
N206:0…249	Parameters 125…249 in the DPI peripheral at DPI port 3
N207:0…1	Number of parameters in the DPI peripheral at DPI port 4
N207:2…249	Parameters 1…124 in the DPI peripheral at DPI port 4
N208:0…249	Parameters 125…249 in the DPI peripheral at DPI port 4
N209:0…1	Number of parameters in the DPI peripheral at DPI port 5
N209:2…249	Parameters 1…124 in the DPI peripheral at DPI port 5
N210:0…249	Parameters 125…249 in the DPI peripheral at DPI port 5
N211:0…1	Number of parameters in the DPI peripheral at DPI port 6
N211:2…249	Parameters 1…124 in the DPI peripheral at DPI port 6
N212:0…249	Parameters 125…249 in the DPI peripheral at DPI port 6
N213:0…1	Number of parameters in the DPI peripheral at DPI port 7
N213:2…249	Parameters 1…124 in the DPI peripheral at DPI port 7
N214:0…249	Parameters 125…249 in the DPI peripheral at DPI port 7
N215:0…1	Number of parameters in the DPI peripheral at DPI port 8
N215:2…249	Parameters 1…124 in the DPI peripheral at DPI port 8
N216:0…249	Parameters 125…249 in the DPI peripheral at DPI port 8
N217:0…1	Number of parameters in the DPI peripheral at DPI port 9
N217:2…249	Parameters 1…124 in the DPI peripheral at DPI port 9
N218:0…249	Parameters 125…249 in the DPI peripheral at DPI port 9
N219:0…1	Number of parameters in the DPI peripheral at DPI port 10
N219:2…249	Parameters 1…124 in the DPI peripheral at DPI port 10
N220:0…249	Parameters 125…249 in the DPI peripheral at DPI port 10
N221:0…1	Number of parameters in the DPI peripheral at DPI port 11
N221:2…249	Parameters 1…124 in the DPI peripheral at DPI port 11
N222:0…249	Parameters 125…249 in the DPI peripheral at DPI port 11
N223:0…1	Number of parameters in the DPI peripheral at DPI port 12
N223:2…249	Parameters 1…124 in the DPI peripheral at DPI port 12
N224:0…249	Parameters 125…249 in the DPI peripheral at DPI port 12
N225:0…1	Number of parameters in the DPI peripheral at DPI port 13
N225:2…249	Parameters 1…124 in the DPI peripheral at DPI port 13
N226:0…249	Parameters 125…249 in the DPI peripheral at DPI port 13
N227:0…1	Number of parameters in the DPI peripheral at DPI port 14
N227:2…249	Parameters 1…124 in the DPI peripheral at DPI port 14
N228:0…249	Parameters 125…249 in the DPI peripheral at DPI port 14

DPI Device Object

Class Code

Hexadecimal	Decimal
0x92	146

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

The number of instances depends on the number of components in the device. The total number of components can be read in Instance 0, Class Attribute 4.

Instances		Device
(Hex.)	(Dec.)	
0x0000…0x3FFF	0…16383	Host Drive
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	Port 1
0x4800…0x4BFF	18432…19455	Port 2
0x4C00…0x4FFF	19456…20479	Port 3
0x5000…0x53FF	20480…21503	Port 4
0x5400…0x57FF	21504…22527	Port 5
0x5800…0x5BFF	22528…23551	Port 6
0x5C00…0x5FFF	23552…24575	Port 7
0x6000…0x63FF	24576…25599	Port 8
0x6400…0x67FF	25600… 26623	Port 9
0x6800…0x6BFF	26624…27647	Port 10
0x6C00…0x6FFF	27648…28671	Port 11
0x7000…0x73FF	28672…29695	Port 12
0x7400…0x77FF	29696…30719	Port 13
0x7800…0x7BFF	30720…31743	Port 14

Example	Description
0	Class Attributes (Drive)
1	Drive Component 1
2	Drive Component 2
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Component 1
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Family Code	USINT	0x00 = DPI Peripheral 0x90 = PowerFlex 750-Series Drive 0xA0 = 20-750-xxxx Option Module 0xFF = HIM
1	Get	Family Text	STRING[16]	Text identifying the device.
2	Set	Language Code	USINT	0 = English 1 = French 2 = Spanish 3 = Italian 4 = German 5 = Japanese 6 = Portuguese 7 = Mandarin Chinese 8 = Russian 9 = Dutch 10 = Korean
3	Get	Product Series	USINT	1 = A 2 = B …
4	Get	Number of Components	USINT	Number of components (for example, main control board, I/O boards) in the device.
5	Set	User Definable Text	STRING[16]	Text identifying the device with a user-supplied name.
6	Get	Status Text	STRING[12]	Text describing the status of the device.
7	Get	Configuration Code	USINT	Identification of variations.
8	Get	Configuration Text	STRING[16]	Text identifying a variation of a family device.
9	Get	Brand Code	UINT	0x0001 = Allen-Bradley
11	Get	NVS Checksum	UINT	Checksum of the Non-Volatile Storage in a device.
12	Get	Class Revision	UINT	2 = DPI
13	Get	Character Set Code	USINT	0 = SCANport HIM 1 = ISO 8859-1 (Latin 1) 2 = ISO 8859-2 (Latin 2) 3 = ISO 8859-3 (Latin 3) 4 = ISO 8859-4 (Latin 4) 5 = ISO 8859-5 (Cyrillic) 6 = ISO 8859-6 (Arabic) 7 = ISO 8859-7 (Greek) 8 = ISO 8859-8 (Hebrew) 9 = ISO 8859-9 (Turkish) 10 = ISO 8859-10 (Nordic) 255 = ISO 10646 (Unicode)
14	Get	Product Option Support	BOOL[64]	
15	Get	Languages Supported	STRUCT of: USINT USINT[n]	 Number of Languages Language Codes (see Class Attribute 2)
16	Get	Date of Manufacture	STRUCT of: UINT USINT USINT	 Year Month Day
17	Get	Product Revision	STRUCT of: USINT USINT	 Major Firmware Release Minor Firmware Release
18	Get	Serial Number	UDINT	Value between 0x00000000 and 0xFFFFFFFF
19	Set	Language Selected	USINT	0 = Default (HIM will prompt at start up) 1 = Language was selected (no prompt)

Attribute ID	Access Rule	Name	Data Type	Description
20	Set	Customer-Generated Firmware	STRING[36]	GUID (Globally Unique Identifier) identifying customer firmware flashed into the device.
30	Get	International Status Text	STRINGN	Text describing the status of device with support for Unicode.
31	Get/Set	International User Definable Text	STRINGN	Text identifying the device with a user-supplied name with support for Unicode.
34	Get	Key Information	STRUCT of: UDINT UDINT UINT UINT UINT USINT USINT USINT USINT USINT USINT[16]	 Rating Code Device Serial Number Customization Code Customization Revision Brand Code Family Code Config Code Language Code Major Revision Minor Revision Customer-Generated Firmware UUID
35	Get	NVS CRC	UDINT	A 32-bit CRC of the Non-Volatile Storage in a device.
38	Set	ADC Configuration Signature	USINT[16]	Value stored by the device and zeroed if its configuration changes.
39	Get	SI Driver Code	UINT	Code identifying the protocol between the device and host.
128	Get	Customization Code	UINT	Code identifying the customized device.
129	Get	Customization Revision Number	UINT	Revision of the customized device.
130	Get	Customization Device Text	STRING[32]	Text identifying the customized device.

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
3	Get	Component Name	STRING[32]	Name of the component
4	Get	Component Firmware Revision	STRUCT of: USINT USINT	 Major Revision Minor Revision
8	Get	Component Serial Number	UDINT	Value between 0x00000000 and 0xFFFFFFFF
9	Get	International Component Name	STRINGN	Name of the component with support for Unicode.

DPI Parameter Object

Class Code

Hexadecimal	Decimal
0x93	147

To access 'Host Config' parameters, use the Host DPI Parameter Object (Class Code 0x9F).

Instances

The number of instances depends on the number of parameters in the device. The total number of parameters can be read in Instance 0, Attribute 0.

Instances		Device
(Hex.)	(Dec.)	
0x0000…0x3FFF	0…16383	Host Drive
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	Port 1
0x4800…0x4BFF	18432…19455	Port 2
0x4C00…0x4FFF	19456…20479	Port 3
0x5000…0x53FF	20480…21503	Port 4
0x5400…0x57FF	21504…22527	Port 5
0x5800…0x5BFF	22528…23551	Port 6
0x5C00…0x5FFF	23552…24575	Port 7
0x6000…0x63FF	24576…25599	Port 8
0x6400…0x67FF	25600…26623	Port 9
0x6800…0x6BFF	26624…27647	Port 10
0x6C00…0x6FFF	27648…28671	Port 11
0x7000…0x73FF	28672…29695	Port 12
0x7400…0x77FF	29696…30719	Port 13
0x7800…0x7BFF	30720…31743	Port 14

Example	Description
0	Class Attributes (Drive)
1	Drive Parameter 1 Attributes
2	Drive Parameter 2 Attributes
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Parameter 1 Attributes
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Number of Instances	UINT	Number of parameters in the device
1	Set	Write Protect Password	UINT	0 = Password disabled n = Password value
2	Set	NVS Command Write	USINT	0 = No Operation 1 = Store values in active memory to NVS 2 = Load values in NVS to active memory 3 = Load default values to active memory 4 = Partial defaults 5 = System defaults
3	Get	NVS Parameter Value Checksum	UINT	Checksum of all parameter values in a user set in NVS
4	Get	NVS Link Value Checksum	UINT	Checksum of parameter links in a user set in NVS
5	Get	First Accessible Parameter	UINT	First parameter available if parameters are protected by passwords. A '0' indicates all parameters are protected.
7	Get	Class Revision	UINT	2 = DPI
8	Get	First Parameter Processing Error	UINT	The first parameter that has been written with a value outside of its range. A '0' indicates no errors.
9	Set	Link Command	USINT	0 = No Operation 1 = Clear All Parameter Links (This does not clear links to function blocks.)

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
6	Get	DPI Offline Read Full	STRUCT of:	
			BOOL[32]	Descriptor
			CONTAINER	Offline Minimum value
			CONTAINER	Offline Maximum value
			CONTAINER	Offline Default value
			STRING[16]	Parameter name
			STRING[4]	Offline parameter units
			UINT	Online minimum parameter instance
			UINT	Online maximum parameter instance
			UINT	Online default parameter instance
			UINT	Multiplier parameter instance
			UINT	Divisor parameter instance
			UINT	Base parameter instance
			UINT	Offset parameter instance
			USINT	Formula number
			USINT	Pad byte (always zero)
			UINT	Help instance
			UINT	Pad word (always a value of zero)
			CONTAINER	Parameter value
			UINT	Multiplier
			UNIT	Divisor
			UNIT	Base
			INT	Offset
7	Get	DPI Online Read Full	STRUCT of:	
			BOOL[32]	Descriptor (see page 151)
			CONTAINER[1]	Parameter value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			UINT	Next parameter
			UINT	Previous parameter
			STRING[4]	Units (for example, Amps, Hz)
			UINT	Multiplier [2]
			UINT	Divisor [2]
			UINT	Base [2]
			INT	Offset [2]
			USINT[3]	Link (source of the value) (0 = no link)
			USINT	Always zero (0)
			STRING[16]	Parameter name
8	Get	DPI Descriptor	BOOL[32]	Descriptor (see page 151)
9	Get/Set	DPI Parameter Value	Various	Parameter value in NVS. [3]
10	Get/Set	DPI RAM Parameter Value	Various	Parameter value in temporary memory. Valid only for DPI drives.
11	Get/Set	DPI Link	USINT[3]	Link (parameter or function block that is the source of the value) (0 = no link)
12	Get	Help Object Instance	UINT	ID for help text for this parameter
13	Get	DPI Read Basic	STRUCT of:	
			BOOL[32]	Descriptor (see page 151)
			CONTAINER	Parameter value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			STRING[16]	Parameter name
			STRING[4]	Units (for example, Amps, Hz)
14	Get	DPI Parameter Name	STRING[16]	Parameter name
15	Get	DPI Parameter Alias	STRING[16]	Customer-supplied parameter name.

Attribute ID	Access Rule	Name	Data Type	Description
16	Get	Parameter Processing Error	USINT	0 = No error 1 = Value is less than the minimum 2 = Value is greater than the maximum
18	Get	International DPI Offline Parameter Text	Struct of: STRINGN STRINGN	 International parameter name International offline units
19	Get	International DPI Online Parameter Text	Struct of: STRINGN STRINGN	 International parameter name International online units
20	Get	International DPI Online Read Full	Struct of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT UINT INT USINT[3] USINT BOOL[32] STRINGN STRINGN	 Descriptor Parameter value Online minimum value Online maximum value Online default value Next Previous Multiplier Divisor Base Offset Link Pad word (always zero) Extended descriptor International parameter name International online parameter units
21	Get	DPI Extended Descriptor	UDINT	Extended Descriptor (see page 152)
22	Get	International DPI Offline Read Full	Struct of: BOOL CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT UINT UINT UINT USINT USINT UINT UINT CONTAINER UINT UINT UINT INT BOOL[32] STRINGN STRINGN	 Descriptor Offline minimum value Offline maximum value Offline default value Online minimum parameter instance Online maximum parameter instance Online default parameter instance Multiplier parameter instance Divisor parameter instance Base parameter instance Offset parameter instance Formula number Pad word (always zero) Help instance Pad word (always a value of zero) Parameter value Multiplier Divisor Base Offset Extended DPI descriptor International DPI parameter name International DPI offline parameter units

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a parameter value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32-bits.

(2) This value is used in the formulas used to convert the parameter value between display units and internal units. See Formulas for Converting on page 153.

(3) Do **not** continually write parameter data to NVS. See the attention on page 91.

Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0). 000 = USINT used as an array of Boolean 001 = UINT used as an array of Boolean 010 = USINT (8-bit integer) 011 = UINT (16-bit integer) 100 = UDINT (32-bit integer) 101 = TCHAR ((8-bit (not Unicode) or 16-bits (Unicode)) 110 = REAL (32-bit floating point value) 111 = Use bits 16, 17, 18
1	Data Type (Bit 2)	
2	Data Type (Bit 3)	
3	Sign Type	0 = unsigned 1 = signed
4	Hidden	0 = visible 1 = hidden
5	Not a Link Sink	0 = May be the sink end of a link 1 = May not be the sink end of a link
6	Not Recallable	0 = Recallable from NVS 1 = Not Recallable from NVS
7	ENUM	0 = No ENUM text 1 = ENUM text
8	Writable	0 = Read only 1 = Read/write
9	Not Writable When Enabled	0 = Writable when enabled (for example, drive running) 1 = Not writable when enabled
10	Instance	0 = Parameter value is not a Reference to another parameter 1 = Parameter value refers to another parameter
11	Uses Bit ENUM Mask	This parameter instance supports the Bit ENUM Mask attribute. For more information, see the definition of the attribute.
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point. 0000 = 0 1111 = 15
13	Decimal Place (Bit 1)	
14	Decimal Place (Bit 2)	
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 4)	Bit 16 is the least significant bit. 000 = Reserved 001 = UDINT used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
17	Extended Data Type (Bit 5)	
18	Extended Data Type (Bit 6)	
19	Parameter Exists	Used to mark parameters that are not available to network tools.
20	Not Used	Reserved
21	Formula Links	Indicates the Formula Data is derived from other parameters.
22	Access Level (Bit 1)	A 3-bit field used to control access to parameter data.
23	Access Level (Bit 2)	
24	Access Level (Bit 3)	
25	Writable ENUM	ENUM text: 0 = Read Only, 1 = Read/Write
26	Not a Link Source	0 = May be the source end of a link 1 = May not be the source end of a link
27	Enhanced Bit ENUM	Parameter supports enhanced bit ENUMs.
28	Enhanced ENUM	Parameter supports enhanced ENUMs.
29	Uses DPI Limits Object	Parameter uses the DPI Limits Object. Intelligent offline tools make use of the Limits Object to select limits and units.
30	Extended Descriptor	Parameter uses Extended Descriptor bits, which can be obtained by reading the DPI Extended Descriptor attribute for this parameter.
31	Always Upload/Download	Parameter shall always be included in uploads and downloads.

Extended Descriptor Attributes

Bit	Name	Description
0	Indirect Mode	0 = Analog (selects entire parameters) 1 = Digital (selects individual bits within parameters)
1	Indirect Type 0	Analog input list (Instance 0xFFFF)
2	Indirect Type 1	Digital input list (Instance 0xFFFE)
3	Indirect Type 2	Feedback list (Instance 0xFFFD)
4	Indirect Type 3	Analog output list (Instance 0xFFFC)
5	Indirect Type 4	Digital output list (Instance 0xFFFB)
6	Indirect Type 5	Undefined (Instance 0xFFFA)
7	Indirect Type 6	Undefined (Instance 0xFFF9)
8	Indirect Type 7	Undefined (Instance 0xFFF8)
9	Indirect Type 8	Undefined (Instance 0xFFF7)
10	Indirect Type 9	Undefined (Instance 0xFFF6)
11	Indirect Type 10	Undefined (Instance 0xFFF5)
12	Indirect Type 11	Undefined (Instance 0xFFF4)
13	Indirect Type 12	Undefined (Instance 0xFFF3)
14	Indirect Type 13	Undefined (Instance 0xFFF2)
15	Indirect Type 14	Parameter-specific list
16	FP Max Decimals Bit 0	These four bits are used on REAL parameters only. They indicate the maximum number of decimal places to be displayed for small values. A value of 0 indicates to not limit the number of decimal places used.
17	FP Max Decimals Bit 1	
18	FP Max Decimals Bit 2	
19	FP Max Decimals Bit 1	
20	Extended Parameter Reference	0 = Not an Extended Parameter Reference 1 = Extended Parameter Reference An Extended Parameter Reference contains a reference to another parameter. The value is formatted the same as an analog mode Indirect Selector parameter (SSpppp, where SS = slot number of device to which this Extended Parameter Reference is pointing, and pppp = number of the parameter or diagnostic item to which this Extended Parameter Reference is pointing). Note that an Extended Parameter Reference can only select parameters unlike an Indirect Selector. An Extended Parameter Reference could be used to configure a Datalink or show the source of a Reference (among other uses).
21	Uses Rating Table Object	This parameter has rating-dependent defaults and limits that can be obtained from the Rating Table Object. The Offline Read Full will include the default value for the smallest rating and limits that will accommodate the full range of values allowed in the family of devices using this particular combination of Family Code and Config Code. The Online Read Full will include the rating-dependent default and limit values for this particular combination of Family Code, Config Code, and Rating Code.
22	Writable Referenced Parameter	This bit must be zero unless the parameter is an Extended Parameter Reference. If the parameter is an Extended Parameter Reference, then: 0 = The referenced parameter may be read-only or writable. 1 = The referenced parameter must always be writable (including while running).
23	Disallow Zero	This bit must be zero unless the parameter is an Indirect Selector or Extended Parameter Reference. If the parameter is an Indirect Selector or Extended Parameter Reference, then: 0 = Allow zero 1 = Disallow zero If this bit is cleared (indicating that a value of zero is allowed), the device must support the 'Zero Text' parameter attribute so that a software tool or HIM can obtain text from the Zero Text parameter attribute. If this bit is set (indicating that a value of zero is disallowed), a software tool or HIM will not allow the user to enter a value of zero.
24	Datalink Out	This bit is used by offline tools and indicates that this is a Datalink Out parameter. Bit 20 must also be set.
25	Datalink In	This bit is used by offline tools and indicates that this is a Datalink In parameter. Bits 20 and 22 must also be set.
26	Not Writable While IO Active	This parameter cannot be written if the I/O data being exchanged between the Host and the peripheral is valid.
27	Command Parameter	This parameter commands the drive to take an action, such as 'Reset Defaults' or 'Autotune', and then returns to a value of zero. Offline software tools will not allow setting this parameter to anything other than a value of zero. If an offline file contains a Command Parameter with a non-zero value, the offline software tool will change the value to zero. Note that command parameters cannot have values that do not return to zero.

Bit	Name	Description
28	Current Value Is Default	This bit identifies a parameter that will not change if a 'Reset Defaults' is commanded. For example, if a drive contains a Language parameter that is set to German, setting defaults will leave the parameter set to German. Likewise, if the parameter is set to French, setting defaults will leave the parameter set to French.
29	Use Zero Text	If the 'Disallow Zero' bit is set, this bit must be cleared. If the 'Disallow Zero' bit is cleared, then: 0 = Use Disabled Text parameter class attribute. 1 = Use Zero Text parameter instance attribute.
30-31	Reserved	Reserved

Formulas for Converting

Display Value = ((Internal Value + Offset) x Multiplier x Base) / (Divisor x $10^{\text{Decimal Places}}$))

Internal Value = ((Display Value x Divisor x $10^{\text{Decimal Places}}$) / (Multiplier x Base)) - Offset

Common Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Object Specific Services

Service Code	Implemented for:		Service Name	Allocation Size (in bytes)	
	Class	Instance		Par. Number	Par. Value
0x4D	Yes	No	Get_Attributes_Scattered	4	4
0x4E	Yes	No	Set_Attributes_Scattered	4	4

The table below lists the parameters for the Get_Attributes_Scattered and Set_Attributes_Scattered object-specific service:

Name	Data Type	Description
Parameter Number	UDINT	Parameter to read or write
Parameter Value	UDINT	Parameter value write (zero when reading)

The response data appears in the following format:

Name	Data Type	Description
Parameter Number	UDINT	Parameter read or write (1)
Parameter Value	UDINT	Parameter value read (zero when writing) (2)

(1) If an error occurred, bit 15 will be turned on in the response.

(2) If an error occurred, the error code will appear instead of the value.

DPI Fault Object

Class Code

Hexadecimal	Decimal
0x97	151

Products such as PowerFlex drives use this object for faults. Adapters use this object for events.

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

The number of instances depends on the maximum number of faults or events supported in the queue. The maximum number of faults/events can be read in Instance 0, Attribute 2.

Instances		Device
(Hex.)	(Dec.)	
0x0000…0x3FFF	0…16383	Host Drive
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	Port 1
0x4800…0x4BFF	18432…19455	Port 2
0x4C00…0x4FFF	19456…20479	Port 3
0x5000…0x53FF	20480…21503	Port 4
0x5400…0x57FF	21504…22527	Port 5
0x5800…0x5BFF	22528…23551	Port 6
0x5C00…0x5FFF	23552…24575	Port 7
0x6000…0x63FF	24576…25599	Port 8
0x6400…0x67FF	25600…26623	Port 9
0x6800…0x6BFF	26624…27647	Port 10
0x6C00…0x6FFF	27648…28671	Port 11
0x7000…0x73FF	28672…29695	Port 12
0x7400…0x77FF	29696…30719	Port 13
0x7800…0x7BFF	30720…31743	Port 14

Example	Description
0	Class Attributes (Drive)
1	Most Recent Drive Fault
2	Second Most Recent Drive Fault
⋮	⋮
16384	Class Attributes (Adapter)
16385	Most Recent Adapter Event
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	Revision of object
2	Get	Number of Instances	UINT	Maximum number of faults/events that the device can record in its queue
3	Set	Fault Command Write	USINT	0 = No Operation 1 = Clear Fault/Event 2 = Clear Fault/Event Queue 3 = Reset Device
4	Get	Fault Trip Instance Read	UINT	Fault that tripped the device. For adapters, this value is always 1 when faulted.
5	Get	Fault Data List	STRUCT of: USINT USINT UINT[n]	Reserved
6	Get	Number of Recorded Faults	UINT	Number of faults/events in the queue. A '0' indicates the fault queue is empty.
7	Get	Fault Parameter Reference	UINT	Reserved

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of UINT STRUCT of: USINT USINT STRING[16] STRUCT of: LWORD BOOL[16] UINT CONTAINER[n]	Fault code Fault source DPI port DPI Device Object Fault text Fault time stamp Timer value (0 = timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2…15]: Not used Reserved Reserved
1	Get	Basic Information	STRUCT of UINT STRUCT of: USINT USINT STRUCT of: LWORD BOOL[16]	Fault code Fault source DPI port DPI Device Object Fault time stamp Timer value (0 = timer not supported) BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2…15]: Not used
2	Get	International Fault Text	STRINGN	Text describing the fault with support for Unicode.

DPI Alarm Object

Class Code

Hexadecimal	Decimal
0x98	152

Products such as PowerFlex drives use this object for alarms or warnings. Adapters do not support this object.

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

The number of instances depends on the maximum number of alarms supported by the queue. The maximum number of alarms can be read in Instance 0, Attribute 2.

Instances		Device
(Hex.)	(Dec.)	
0x0000…0x3FFF	0…16383	Host Drive

Only host devices can have alarms.

Example	Description
0	Class Attributes (Drive)
1	Most Recent Alarm
2	Second Most Recent Alarm
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	Revision of object
2	Get	Number of Instances	UINT	Maximum number of alarms that the device can record in its queue
3	Set	Alarm Command Write	USINT	0 = No Operation 1 = Clear Alarm 2 = Clear Alarm Queue 3 = Reset Device
4	Get	Fault Data List	STRUCT of: USINT USINT UINT[n]	Reserved
5	Get	Number of Recorded Alarms	UINT	Number of alarms in the queue. A '0' indicates the alarm queue is empty.

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of UINT	Alarm code
			STRUCT of:	Alarm source
			USINT	DPI port
			USINT	DPI Device Object
			STRING[16]	Alarm text
			STRUCT of:	Alarm time stamp
			LWORD	Timer value (0 = timer not supported)
			BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15] Reserved
			UINT	Reserved
			CONTAINER[n]	Reserved
1	Get	Basic Information	STRUCT of UINT	Alarm code
			STRUCT of:	Alarm source
			USINT	DPI port
			USINT	DPI Device Object
			STRUCT of:	Alarm time stamp
			LWORD	Timer value (0 = timer not supported)
			BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data)
				BOOL[1]: (0 = elapsed time, 1 = real time)
				BOOL[2…15] Reserved
2	Get	International Alarm Text	STRINGN	Text describing the alarm with support for Unicode.

DPI Diagnostic Object

Class Code

Hexadecimal	Decimal
0x99	153

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

The number of instances depends on the maximum number of diagnostic items in the device. The total number of diagnostic items can be read in Instance 0, Attribute 2.

Instances		Device
(Hex.)	(Dec.)	
0x0000…0x3FFF	0…16383	Host Drive
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	Port 1
0x4800…0x4BFF	18432…19455	Port 2
0x4C00…0x4FFF	19456…20479	Port 3
0x5000…0x53FF	20480…21503	Port 4
0x5400…0x57FF	21504…22527	Port 5
0x5800…0x5BFF	22528…23551	Port 6
0x5C00…0x5FFF	23552…24575	Port 7
0x6000…0x63FF	24576…25599	Port 8
0x6400…0x67FF	25600…26623	Port 9
0x6800…0x6BFF	26624…27647	Port 10
0x6C00…0x6FFF	27648…28671	Port 11
0x7000…0x73FF	28672…29695	Port 12
0x7400…0x77FF	29696…30719	Port 13
0x7800…0x7BFF	30720…31743	Port 14

Example	Description
0	Class Attributes (Drive)
1	Drive Diagnostic Item 1
2	Drive Diagnostic Item 2
⋮	⋮
16384	Class Attributes (Adapter)
16385	Adapter Diagnostic Item 1
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	1
2	Get	Number of Instances	UINT	Number of diagnostic items in the device
3	Get	ENUM Offset	UINT	DPI ENUM object instance offset

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Full/All Information	STRUCT of:	
			BOOL[32]	Descriptor (see page 151)
			CONTAINER (1)	Value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			UINT	Pad Word
			UINT	Pad Word
			STRING[4]	Units (for example, Amps, Hz)
			UINT	Multiplier (2)
			UINT	Divisor (2)
			UINT	Base (2)
			INT	Offset (2)
			UDINT	Link (source of the value) (0 = no link)
			STRING[16]	Diagnostic name text
1	Get/Set	Value	Various	Diagnostic item value
2	Get	International Diagnostic Item Text	Struct of:	
			STRINGN	Diagnostic name text
			STRINGN	Diagnostic units text
3	Get	International Full Read All	STRUCT of:	
			BOOL[32]	Descriptor
			CONTAINER	Value
			CONTAINER	Minimum
			CONTAINER	Maximum
			CONTAINER	Default
			UINT	Pad word
			UINT	Pad word
			UINT	Multiplier
			UINT	Divisor
			UINT	Base
			INT	Offset
			UDINT	Pad
			BOOL[32]	Extended descriptor
			STRINGN	Diagnostic name text
			STRINGN	Diagnostic units text

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32-bits.

(2) This value is used in the formulas used to convert the value between display units and internal units. See Formulas for Converting on page 153.

DPI Time Object

Class Code

Hexadecimal	Decimal
0x9B	155

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Instances

The number of instances depends on the number of timers in the device. Instance 1 is always reserved for a real time clock although a device may not support it. The total number of timers can be read in Instance 0, Attribute 2.

Instances		Device
(Hex.)	(Dec.)	
0x0000…0x3FFF	0…16383	Host Drive
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	Port 1
0x4800…0x4BFF	18432…19455	Port 2
0x4C00…0x4FFF	19456…20479	Port 3
0x5000…0x53FF	20480…21503	Port 4
0x5400…0x57FF	21504…22527	Port 5
0x5800…0x5BFF	22528…23551	Port 6
0x5C00…0x5FFF	23552…24575	Port 7
0x6000…0x63FF	24576…25599	Port 8
0x6400…0x67FF	25600…26623	Port 9
0x6800…0x6BFF	26624…27647	Port 10
0x6C00…0x6FFF	27648…28671	Port 11
0x7000…0x73FF	28672…29695	Port 12
0x7400…0x77FF	29696…30719	Port 13
0x7800…0x7BFF	30720…31743	Port 14

Example	Description
0	Class Attributes (Drive)
1	Real Time Clock (Predefined) (not always supported)
2	Timer 1
3	Timer 2
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Class Revision	UINT	Revision of object
2	Get	Number of Instances	UINT	Number of timers in the object, excluding the real time clock that is predefined.
3	Get	First Device Specific Timer	UINT	Instance of the first timer that is not predefined.
4	Set	Time Command Write	USINT	0 = No Operation 1 = Clear all timers (Does not clear real time clock or read only timers)
5	Get	Number of Supported Time Zones	UINT	Number of time zones described in the Time Zone List attribute.
6	Get	Time Zone List	STRUCT	Identifies a time zone.
7	Get/Set	Active Time Zone ID	UINT	The ID field of the Time Zone List structure for the desired time zone.

Attribute ID	Access Rule	Name	Data Type	Description
8	Get	Active Time Zone Data	Struct of: INT USINT USINT USINT USINT USINT USINT INT USINT USINT USINT USINT USINT USINT	 Standard bias Standard month Standard day of week Standard week Standard hour Standard minute Standard second Daylight offset Daylight month Daylight day of week Daylight week Daylight hour Daylight minute Daylight second
9	Get/Set	Custom Time Zone Data	Struct of: INT USINT USINT USINT USINT USINT USINT INT USINT USINT USINT USINT USINT USINT	 Standard bias Standard month Standard day of week Standard week Standard hour Standard minute Standard second Daylight offset Daylight month Daylight day of week Daylight week Daylight hour Daylight minute Daylight second

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Read Full	STRUCT of: STRING[16] LWORD or STRUCT BOOL[16]	 Name of the timer Elapsed time in milliseconds unless timer is a real time clock (see attribute 2) See Attribute 3
1	Get	Timer Text	STRING[16]	Name of the timer
2	Get/Set	Timer Value	LWORD -or- STRUCT of: UINT USINT USINT USINT USINT USINT USINT	Elapsed time in milliseconds unless the timer is a real time clock. Real Time Clock Data: Milliseconds (0…999) Seconds (0…59) Minutes (0…59) Hours (0…23) Days (1…31) Months (1 = January, 12 = December) Years (since 1972)
3	Get	Timer Descriptor	BOOL[16]	BOOL[0]: (0 = invalid data, 1 = valid data) BOOL[1]: (0 = elapsed time, 1 = real time) BOOL[2…15]: Not used
4	Get	International Read Full	Struct of: STRINGN STRUCT BOOL[16]	 International timer text Timer value Timer descriptor
5	Get	International Timer Text	STRINGN	Name of this timer
6	Get	Clock Status	BOOL[32]	Identifies clock status
8	Get/Set	Number of Leap Seconds	INT	Identifies the current number of Leap Seconds.
9	Get	Clock Options	BOOL[32]	Identifies the optional functionality available in the device's System Clock.
10	Get/Set	Clock Options Enable	BOOL[32]	Identifies which of the clock's options are enabled.

Host DPI Parameter Object

Class Code

Hexadecimal	Decimal
0x9F	159

To access 'Device' parameters, use the DPI Parameter Object (Class Code 0x93).

Instances

The number of instances depends on the number of parameters in the device. The total number of parameters can be read in Instance 0, Attribute 0.

Instances		Device
(Hex.)	(Dec.)	
0x0000…0x3FFF	0…16383	Reserved
0x4000…0x43FF	16384…17407	Adapter
0x4400…0x47FF	17408…18431	Port 1
0x4800…0x4BFF	18432…19455	Port 2
0x4C00…0x4FFF	19456…20479	Port 3
0x5000…0x53FF	20480…21503	Port 4
0x5400…0x57FF	21504…22527	Port 5
0x5800…0x5BFF	22528…23551	Port 6
0x5C00…0x5FFF	23552…24575	Port 7
0x6000…0x63FF	24576…25599	Port 8
0x6400…0x67FF	25600…26623	Port 9
0x6800…0x6BFF	26624…27647	Port 10
0x6C00…0x6FFF	27648…28671	Port 11
0x7000…0x73FF	28672…29695	Port 12
0x7400…0x77FF	29696…30719	Port 13
0x7800…0x7BFF	30720…31743	Port 14

Example	Description
16384	Class Attributes (Adapter)
16385	Adapter Parameter 1 Attributes
16386	Adapter Parameter 2 Attributes
⋮	⋮
17408	Class Attributes (HIM)
17409	HIM Parameter 1 Attributes
17410	HIM Parameter 2 Attributes
⋮	⋮

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
0	Get	Number of Instances	UINT	Number of parameters in the device
1	Set	Write Protect Password	UINT	0 = Password disabled n = Password
2	Set	NVS Command Write	USINT	0 = No Operation 1 = Store values in active memory to NVS 2 = Load values in NVS to active memory 3 = Load default values to active memory
3	Get	NVS Parameter Value Checksum	UINT	Checksum of all parameter values in a user set in NVS
4	Get	NVS Link Value Checksum	UINT	Checksum of parameter links in a user set in NVS
5	Get	First Accessible Parameter	UINT	First parameter available if parameters are protected by passwords. A '0' indicates all parameters are protected.
7	Get	Class Revision	UINT	2 = DPI
8	Get	First Parameter Processing Error	UINT	The first parameter that has been written with a value outside of its range. A '0' indicates no errors.
9	Set	Link Command	USINT	0 = No Operation 1 = Clear All Parameter Links (This does not clear links to function blocks.)

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
6	Get	DPI Offline Read Full	STRUCT of:	
			BOOL[32]	Descriptor
			CONTAINER	Offline Minimum value
			CONTAINER	Offline Maximum value
			CONTAINER	Offline Default value
			STRING[16]	Parameter name
			STRING[4]	Offline parameter units
			UINT	Online minimum parameter instance
			UINT	Online maximum parameter instance
			UINT	Online default parameter instance
			UINT	Multiplier parameter instance
			UINT	Divisor parameter instance
			UINT	Base parameter instance
			UINT	Offset parameter instance
			USINT	Formula number
			USINT	Pad byte (always zero)
			UINT	Help instance
			UINT	Pad word (always a value of zero)
			CONTAINER	Parameter value
			UINT	Multiplier
			UNIT	Divisor
			UNIT	Base
			INT	Offset
7	Get	DPI Online Read Full	STRUCT of:	
			BOOL[32]	Descriptor (see page 165)
			CONTAINER[1]	Parameter value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			UINT	Next parameter
			UINT	Previous parameter
			STRING[4]	Units (for example, Amps, Hz)
			UINT	Multiplier [2]
			UINT	Divisor [2]
			UINT	Base [2]
			INT	Offset [2]
			USINT[3]	Link (source of the value) (0 = no link)
			USINT	Always zero (0)
			STRING[16]	Parameter name
8	Get	DPI Descriptor	BOOL[32]	Descriptor (see page 165)
9	Get/Set	DPI Parameter Value	Various	Parameter value in NVS. [3]
10	Get/Set	DPI RAM Parameter Value	Various	Parameter value in temporary memory. Valid only for DPI drives.
11	Get/Set	DPI Link	USINT[3]	Link (parameter or function block that is the source of the value) (0 = no link)
12	Get	Help Object Instance	UINT	ID for help text for this parameter
13	Get	DPI Read Basic	STRUCT of:	
			BOOL[32]	Descriptor (see page 165)
			CONTAINER	Parameter value
			CONTAINER	Minimum value
			CONTAINER	Maximum value
			CONTAINER	Default value
			STRING[16]	Parameter name
			STRING[4]	Units (for example, Amps, Hz)
14	Get	DPI Parameter Name	STRING[16]	Parameter name
15	Get	DPI Parameter Alias	STRING[16]	Customer supplied parameter name.

Attribute ID	Access Rule	Name	Data Type	Description
16	Get	Parameter Processing Error	USINT	0 = No error 1 = Value is less than the minimum 2 = Value is greater than the maximum
18	Get	International DPI Offline Parameter Text	Struct of: STRINGN STRINGN	 International parameter name International offline units
19	Get	International DPI Online Parameter Text	Struct of: STRINGN STRINGN	 International parameter name International online units
20	Get	International DPI Online Read Full	Struct of: BOOL[32] CONTAINER CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT UINT INT USINT[3] USINT BOOL[32] STRINGN STRINGN	 Descriptor Parameter value Online minimum value Online maximum value Online default value Next Previous Multiplier Divisor Base Offset Link Pad word (always zero) Extended descriptor International parameter name International online parameter units
21	Get	DPI Extended Descriptor	UDINT	Extended Descriptor (see page 166)
22	Get	International DPI Offline Read Full	Struct of: BOOL CONTAINER CONTAINER CONTAINER UINT UINT UINT UINT UINT UINT UINT USINT USINT UINT UINT CONTAINER UINT UINT UINT INT BOOL[32] STRINGN STRINGN	 Descriptor Offline minimum value Offline maximum value Offline default value Online minimum parameter instance Online maximum parameter instance Online default parameter instance Multiplier parameter instance Divisor parameter instance Base parameter instance Offset parameter instance Formula number Pad word (always zero) Help instance Pad word (always a value of zero) Parameter value Multiplier Divisor Base Offset Extended DPI descriptor International DPI parameter name International DPI offline parameter units

(1) A CONTAINER is a 32-bit block of data that contains the data type used by a parameter value. If signed, the value is sign extended. Padding is used in the CONTAINER to ensure that it is always 32-bits.

(2) This value is used in the formulas used to convert the parameter value between display units and internal units. See Formulas for Converting on page 167.

(3) Do **not** continually write parameter data to NVS. See the attention on page 91.

Descriptor Attributes

Bit	Name	Description
0	Data Type (Bit 1)	Right bit is least significant bit (0). 000 = USINT used as an array of Boolean 001 = UINT used as an array of Boolean 010 = USINT (8-bit integer) 011 = UINT (16-bit integer) 100 = UDINT (32-bit integer) 101 = TCHAR ((8-bit (not Unicode) or 16-bits (Unicode)) 110 = REAL (32-bit floating point value) 111 = Use bits 16, 17, 18
1	Data Type (Bit 2)	
2	Data Type (Bit 3)	
3	Sign Type	0 = unsigned 1 = signed
4	Hidden	0 = visible 1 = hidden
5	Not a Link Sink	0 = May be the sink end of a link 1 = May not be the sink end of a link
6	Not Recallable	0 = Recallable from NVS 1 = Not Recallable from NVS
7	ENUM	0 = No ENUM text 1 = ENUM text
8	Writable	0 = Read only 1 = Read/write
9	Not Writable When Enabled	0 = Writable when enabled (for example, drive running) 1 = Not writable when enabled
10	Instance	0 = Parameter value is not a Reference to another parameter 1 = Parameter value refers to another parameter
11	Uses Bit ENUM Mask	This parameter instance supports the Bit ENUM Mask attribute. For more information, see the definition of the attribute.
12	Decimal Place (Bit 0)	Number of digits to the right of the decimal point. 0000 = 0 1111 = 15
13	Decimal Place (Bit 1)	
14	Decimal Place (Bit 2)	
15	Decimal Place (Bit 3)	
16	Extended Data Type (Bit 4)	Bit 16 is the least significant bit. 000 = Reserved 001 = UDINT used as an array of Boolean 010 = Reserved 011 = Reserved 100 = Reserved 101 = Reserved 110 = Reserved 111 = Reserved
17	Extended Data Type (Bit 5)	
18	Extended Data Type (Bit 6)	
19	Parameter Exists	Used to mark parameters that are not available to network tools.
20	Not Used	Reserved
21	Formula Links	Indicates the Formula Data is derived from other parameters.
22	Access Level (Bit 1)	A 3-bit field used to control access to parameter data.
23	Access Level (Bit 2)	
24	Access Level (Bit 3)	
25	Writable ENUM	ENUM text: 0 = Read Only, 1 = Read/Write
26	Not a Link Source	0 = May be the source end of a link 1 = May not be the source end of a link
27	Enhanced Bit ENUM	Parameter supports enhanced bit ENUMs.
28	Enhanced ENUM	Parameter supports enhanced ENUMs.
29	Uses DPI Limits Object	Parameter uses the DPI Limits Object. Intelligent offline tools make use of the Limits Object to select limits and units.
30	Extended Descriptor	Parameter uses Extended Descriptor bits, which can be obtained by reading the DPI Extended Descriptor attribute for this parameter.
31	Always Upload/Download	Parameter shall always be included in uploads and downloads.

Extended Descriptor Attributes

Bit	Name	Description
0	Indirect Mode	0 = Analog (selects entire parameters) 1 = Digital (selects individual bits within parameters)
1	Indirect Type 0	Analog input list (Instance 0xFFFF)
2	Indirect Type 1	Digital input list (Instance 0xFFFE)
3	Indirect Type 2	Feedback list (Instance 0xFFFD)
4	Indirect Type 3	Analog output list (Instance 0xFFFC)
5	Indirect Type 4	Digital output list (Instance 0xFFFB)
6	Indirect Type 5	Undefined (Instance 0xFFFA)
7	Indirect Type 6	Undefined (Instance 0xFFF9)
8	Indirect Type 7	Undefined (Instance 0xFFF8)
9	Indirect Type 8	Undefined (Instance 0xFFF7)
10	Indirect Type 9	Undefined (Instance 0xFFF6)
11	Indirect Type 10	Undefined (Instance 0xFFF5)
12	Indirect Type 11	Undefined (Instance 0xFFF4)
13	Indirect Type 12	Undefined (Instance 0xFFF3)
14	Indirect Type 13	Undefined (Instance 0xFFF2)
15	Indirect Type 14	Parameter-specific list
16	FP Max Decimals Bit 0	These four bits are used on REAL parameters only. They indicate the maximum number of decimal places to be displayed for small values. A value of 0 indicates to not limit the number of decimal places used.
17	FP Max Decimals Bit 1	
18	FP Max Decimals Bit 2	
19	FP Max Decimals Bit 1	
20	Extended Parameter Reference	0 = Not an Extended Parameter Reference 1 = Extended Parameter Reference An Extended Parameter Reference contains a reference to another parameter. The value is formatted the same as an analog mode Indirect Selector parameter (SSpppp, where SS = slot number of device to which this Extended Parameter Reference is pointing, and pppp = number of the parameter or diagnostic item to which this Extended Parameter Reference is pointing). Note that an Extended Parameter Reference can only select parameters unlike an Indirect Selector. An Extended Parameter Reference could be used to configure a Datalink or show the source of a Reference (among other uses).
21	Uses Rating Table Object	This parameter has rating-dependent defaults and limits that can be obtained from the Rating Table Object. The Offline Read Full will include the default value for the smallest rating and limits that will accommodate the full range of values allowed in the family of devices using this particular combination of Family Code and Config Code. The Online Read Full will include the rating-dependent default and limit values for this particular combination of Family Code, Config Code, and Rating Code.
22	Writable Referenced Parameter	This bit must be zero unless the parameter is an Extended Parameter Reference. If the parameter is an Extended Parameter Reference, then: 0 = The referenced parameter may be read-only or writable. 1 = The referenced parameter must always be writable (including while running).
23	Disallow Zero	This bit must be zero unless the parameter is an Indirect Selector or Extended Parameter Reference. If the parameter is an Indirect Selector or Extended Parameter Reference, then: 0 = Allow zero 1 = Disallow zero If this bit is cleared (indicating that a value of zero is allowed), the device must support the 'Zero Text' parameter attribute so that a software tool or HIM can obtain text from the Zero Text parameter attribute. If this bit is set (indicating that a value of zero is disallowed), a software tool or HIM will not allow the user to enter a value of zero.
24	Datalink Out	This bit is used by offline tools and indicates that this is a Datalink Out parameter. Bit 20 must also be set.
25	Datalink In	This bit is used by offline tools and indicates that this is a Datalink In parameter. Bits 20 and 22 must also be set.
26	Not Writable While IO Active	This parameter cannot be written if the I/O data being exchanged between the Host and the peripheral is valid.
27	Command Parameter	This parameter commands the drive to take an action, such as 'Reset Defaults' or 'Autotune', and then returns to a value of zero. Offline software tools will not allow setting this parameter to anything other than a value of zero. If an offline file contains a Command Parameter with a non-zero value, the offline software tool will change the value to zero. Note that command parameters cannot have values that do not return to zero.

Bit	Name	Description
28	Current Value Is Default	This bit identifies a parameter that will not change if a 'Reset Defaults' is commanded. For example, if a drive contains a Language parameter that is set to German, setting defaults will leave the parameter set to German. Likewise, if the parameter is set to French, setting defaults will leave the parameter set to French.
29	Use Zero Text	If the 'Disallow Zero' bit is set, this bit must be cleared. If the 'Disallow Zero' bit is cleared, then: 0 = Use Disabled Text parameter class attribute. 1 = Use Zero Text parameter instance attribute.
30-31	Reserved	Reserved

Formulas for Converting

Display Value = ((Internal Value + Offset) x Multiplier x Base) / (Divisor x $10^{\text{Decimal Places}}$))

Internal Value = ((Display Value x Divisor x $10^{\text{Decimal Places}}$) / (Multiplier x Base)) - Offset

Common Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	Yes	Yes	Set_Attribute_Single

Object Specific Services

Service Code	Implemented for:		Service Name	Allocation Size (in bytes)	
	Class	Instance		Par. Number	Par. Value
0x4D	Yes	No	Get_Attributes_Scattered	4	4
0x4E	Yes	No	Set_Attributes_Scattered	4	4

The table below lists the parameters for the Get_Attributes_Scattered and Set_Attributes_Scattered object-specific service:

Name	Data Type	Description
Parameter Number	UDINT	Parameter to read or write
Parameter Value	UDINT	Parameter value write (zero when reading)

The response data appears in the following format:

Name	Data Type	Description
Parameter Number	UDINT	Parameter read or write (1)
Parameter Value	UDINT	Parameter value read (zero when writing) (2)

(1) If an error occurred, bit 15 will be turned on in the response.

(2) If an error occurred, the error code will appear instead of the value.

TCP/IP Interface Object

Class Code

Hexadecimal	Decimal
0xF5	245

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Instances

The adapter supports one instance of the TCP/IP Interface object.

Number	Description
0	Class Attributes
1	Object Attributes

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	The revision of this object

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Status of TCP/IP Network Interface	UDINT	0 = Not configured 1 = Valid configuration 2…15 = Reserved
2	Get	Configuration Capability	UDINT	Bit | Value (0 = False, 1 = True) 0 = Supports BOOTP 1 = DNS Client (able to resolve host names by query to DNS server) 2 = DHCP Client (able to obtain network configuration through DHCP) 3 = DHCP-DNS Update (able to send its host name in the DHCP request) 4 = Configuration Settable (able to set the network configuration via TCP/IP object) 5…31 = Reserved
3	Set	Configuration Control	UDINT	Bit | Value 0…3 = Startup configuration 0 = Use configuration saved in NVS 1 = Obtain configuration via BOOTP 2 = Obtain configuration via DHCP 3…15 = Reserved 4 = DNS Enabled (resolves host names by query to DNS server) 5…31 = Reserved

Attribute ID	Access Rule	Name	Data Type	Description
4	Get	Physical Link Object	STRUCT of: UINT Padded EPATH	 Path size Path
5	Get	Interface Configuration	STRUCT of: UDINT UDINT UDINT UDINT UDINT STRING	 Adapter IP address Adapter subnet mask Adapter gateway address Primary name server Secondary name server Default domain name
6	Get	Host Name	STRING	Host name when using DHCP

Ethernet Link Object

Class Code

Hexadecimal	Decimal
0xF6	246

Services

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x4C	No	Yes	Get_and_Clear

Instances

The adapter supports one instance of the TCP/IP Interface object.

Number	Description
0	Class Attributes
1	Object Attributes

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT	The revision of this object

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description
1	Get	Interface Speed	UDINT	Speed in megabits per second (Mbs)
2	Get	Interface Flags	UDINT	Bit | Value 0 = Link status (0 = inactive, 1 = active) 1 = Duplex (0 = half duplex, 1 = full duplex) 2…31 = Reserved
3	Get	Physical Address	USINT[6]	MAC address (XX-XX-XX-XX-XX-XX) The first octet (USINT[0]) is on the left.
4	Get	Interface Counters	STRUCT of: UDINT UDINT UDINT UDINT UDINT UDINT UDINT UDINT UDINT UDINT UDINT	 Octets received Unicast packets received Non-unicast packets received Inbound packets received but discarded Inbound packets with errors (not discarded) Inbound packets with unknown protocol Octets sent Unicast packets sent Non-unicast packets sent Outbound packets discarded Outbound packets with errors

Attribute ID	Access Rule	Name	Data Type	Description
5	Get	Media Counters	STRUCT of:	RX = Received, TX = Transmitted
			UDINT	RX frames not having integral number of octets long
			UDINT	RX frames not passing FCS check
			UDINT	TX frames having one collision
			UDINT	TX frames having multiple collisions
			UDINT	Number of times of SQE test error message
			UDINT	TX Frames delayed first attempt by busy medium
			UDINT	Collisions detected later than 512 bit-times in trans.
			UDINT	TX frames failing due to excessive collisions
			UDINT	TX frames failing due to intern MAC sublayer TX error
			UDINT	Times of carrier sense condition loss during trans
			UDINT	RX frames exceeding the maximum frame size
			UDINT	RX frames failing due to intern MAC sublayer RX error

Notes:

Logic Command/Status Words: PowerFlex 750-Series Drives

This appendix presents the definitions of the Logic Command and Logic Status words that are used for PowerFlex 750-Series drives.

Logic Command Word

Logic Bits																													
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
																															x	Normal Stop	0 = Not Normal Stop 1 = Normal Stop
																														x		Start (1)	0 = Not Start 1 = Start
																													x			Jog 1 (2)	0 = Not Jog 1 (Par. 556) 1 = Jog 1
																												x				Clear Fault (3)	0 = Not Clear Fault 1 = Clear Fault
																										x	x					Unipolar Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
																									x							Manual	0 = Not Manual 1 = Manual
																								x								Reserved	
																						x	x									Accel Time	00 = No Command 01 = Use Accel Time 1 (Par. 535) 10 = Use Accel Time 2 (Par. 536) 11 = Use Present Time
																				x	x											Decel Time	00 = No Command 01 = Use Decel Time 1 (Par. 537) 10 = Use Decel Time 2 (Par. 538) 11 = Use Present Time
																			x													Ref Select 1	000 = No Command 001 = Ref A Select (Par. 545) 010 = Ref B Select (Par. 550) 011 = Preset 3 (Par. 573) 100 = Preset 4 (Par. 574) 101 = Preset 5 (Par. 575) 110 = Preset 6 (Par. 576) 111 = Preset 7 (Par. 577)
																		x														Ref Select 2	
																	x															Ref Select 3	
																x																Reserved	
															x																	Coast Stop	0 = Not Coast to Stop 1 = Coast to Stop
														x																		Current Limit Stop	0 = Not Current Limit Stop 1 = Current Limit Stop
													x																			Run (4)	0 = Not Run 1 = Run
												x																				Jog 2 (2)	0 = Not Jog 2 (Par. 557) 1 = Jog 2
											x																					Reserved	
										x																						Reserved	
									x																							Reserved	
								x																								Reserved	
							x																									Reserved	
						x																										Reserved	
					x																											Reserved	
				x																												Reserved	
			x																													Reserved	
		x																														Reserved	
	x																															Reserved	
x																																Reserved	

(1) A Not Stop condition (logic bit 0 = 0) must first be present before a 1 = Start condition will start the drive.
(2) A Not Stop condition (logic bit 0 = 0) must first be present before a 1 = Jog 1/Jog 2 condition will jog the drive. A transition to a '0' will stop the drive.
(3) To perform this command, the value must switch from '0' to '1'.
(4) A Not Stop condition (logic bit 0 = 0) must first be present before a 1 = Run condition will run the drive. A transition to a '0' will stop the drive.

Logic Status Word

Logic Bits																													
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
																															x	Run Ready	0 = Not Ready to Run 1 = Ready to Run
																														x		Active	0 = Not Active 1 = Active
																													x			Command Direction	0 = Reverse 1 = Forward
																												x				Actual Direction	0 = Reverse 1 = Forward
																											x					Accelerating	0 = Not Accelerating 1 = Accelerating
																										x						Decelerating	0 = Not Decelerating 1 = Decelerating
																									x							Alarm	0 = No Alarm (Par. 959 and 960) 1 = Alarm
																								x								Fault	0 = No Fault (Par. 952 and 953) 1 = Fault
																							x									At Setpt Spd	0 = Not at Setpoint Speed 1 = At Setpoint Speed
																						x										Manual	0 = Manual Mode Not Active 1 = Manual Mode Active
																					x											Spd Ref ID 0	00000 = Reserved 00001 = Auto Ref A (Par. 545) 00010 = Auto Ref B (Par. 550) 00011 = Auto Preset Speed 3 (Par. 573) 00100 = Auto Preset Speed 4 (Par. 574) 00101 = Auto Preset Speed 5 (Par. 575) 00110 = Auto Preset Speed 6 (Par. 576) 00111 = Auto Preset Speed 7 (Par. 577) 01000 = Reserved 01001 = Reserved 01010 = Reserved 01011 = Reserved 01100 = Reserved 01101 = Reserved 01110 = Reserved 01111 = Reserved 10000 = Man Port 0 10001 = Man Port 1 10010 = Man Port 2 10011 = Man Port 3 10100 = Man Port 4 10101 = Man Port 5 10110 = Man Port 6 10111 = Reserved 11000 = Reserved 11001 = Reserved 11010 = Reserved 11011 = Reserved 11100 = Reserved 11101 = Man Port 13 (embedded ENET) 11110 = Man Port 14 (Drive Logix) 11111 = Alternate Man Ref Sel
																				x												Spd Ref ID 1	
																			x													Spd Ref ID 2	
																		x														Spd Ref ID 3	
																	x															Spd Ref ID 4	
																x																Reserved	
															x																	Running	0 = Not Running 1 = Running
														x																		Jogging	0 = Not Jogging (Par. 556 and 557) 1 = Jogging
													x																			Stopping	0 = Not Stopping 1 = Stopping
												x																				DC Brake	0 = Not DC Brake 1 = DC Brake
											x																					DB Active	0 = Not Dynamic Brake Active 1 = Dynamic Brake Active
										x																						Speed Mode	0 = Not Speed Mode (Par. 309) 1 = Speed Mode
									x																							Position Mode	0 = Not Position Mode (Par. 309) 1 = Position Mode
								x																								Torque Mode	0 = Not Torque Mode (Par. 309) 1 = Torque Mode
							x																									At Zero Speed	0 = Not at Zero Speed 1 =At Zero Speed
						x																										At Home	0 = Not at Home 1 = At Home
					x																											At Limit	0 = Not at Limit 1 = At Limit
				x																												Current Limit	0 = Not at Current Limit 1 = At Current Limit
			x																													Bus Freq Reg	0 = Not Bus Freq Reg 1 = Bus Freq Reg
		x																														Enable On	0 = Not Enable On 1 = Enable On
	x																															Motor Overload	0 = Not Motor Overload 1 = Motor Overload
x																																Regen	0 = Not Regen 1= Regen

History of Changes

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This appendix summarizes the revisions to this manual. Reference this appendix if you need information to determine what changes have been made across multiple revisions. This may be especially useful if you are deciding to upgrade your hardware or software based on information added with previous revisions of this manual.

750COM-UM001D-EN-P, February 2012

Change
In the 'Features' section of Chapter 1, added new bulleted text stating that the embedded adapter supports CIP Motion operation for the PowerFlex 755 drive (firmware 2.003 or later).
In the 'To set up the slave (receiver) side of simple peer I/O' section, corrected Step 3 in setting drive parameter 308 - [Direction Mode] from '1' (Bipolar) to '0' (Unipolar).
In the 'To set up the slave (receiver) side of custom peer I/O' section: • Revised Step 7 to include an example for setting **Parameter 78 - [Logic Src Cfg]**. • Revised Step 8 to include an example for setting **Parameter 79 - [Ref Src Cfg]**. • Revised Step 9 to set drive parameter 308 - [Direction Mode] from '1' (Bipolar) to '0' (Unipolar).
At the beginning of the 'ControlLogix Example' section in Chapter 4, added information about where to find how to set up CIP Motion operation.
In the 'Using Automatic Device Configuration (ADC) with RSLogix 5000 version 20 (or later)' section of the manual: • Added subsection 'Version 4.01 Drive Add-On Profiles (AOPs)'. • Added subsection 'Version 4.02 Drive Add-On Profiles (AOPs)'. • In subsection 'Configuring a PowerFlex 755 Drive (version 4.01 or later) for ADC', added new Step 6. • Added subsection 'ADC and Logix Memory'. • Added subsection 'Special Considerations When Using a DeviceLogix Program'. • Moved subsection 'Monitoring ADC Progress' to the end of this main section.
In Appendix B: • Changed Important statement for **Parameter 89 - [To Peer Period]** to say that changes to this parameter are ignored when **Parameter 91 - [To Peer Enable]** is '1' (On). • Changed Important statement for **Parameter 90 - [To Skip Peer]** to say that changes to this parameter are ignored when **Parameter 91 - [To Peer Enable]** is '1' (On).
In Appendix C: • At the end of the section 'DPI Parameter Object', in the 'Object Specific Services' subsection, added response data information. • At the end of the section 'Host DPI Parameter Object', in the 'Object Specific Services' subsection, added response data information.

750COM-UM001C-EN-P, November 2011

Change
In the Using Automatic Device Configuration (ADC) with RSLogix 5000 version 20 (or later) section of the manual: • Revised the first statement in the Important table to read '**ADC is enabled by default** and will be triggered…' • In the table below Figure 46: – Changed the description for the 'Enable Automatic Device Configuration' row. – Added the following statement at the end of the description for the 'Fail Drive Connection on Peripheral Error' row: Note that when a failure occurs, RSLogix will show both a configuration on Port 0 (drive) and Port 'xx' (peripheral) error. • In step 5, added an Attention table. • In step 7, added an Important table. • In the 'Special Considerations When Using a 20-750-S1 Safe Speed Monitor Module' subsection, revised the last statement in the Important table to read 'These two parameters need to be changed manually after performing an upload or after the ADC download'.

750COM-UM001B-EN-P, October 2011

Change
Added references to ODVA publications for EtherNet/IP information.
In the Features section, added Automatic Device Configuration (ADC).
In the 'Configuring/Verifying Key Drive Parameters' subsection, revised steps for establishing the drive speed reference from the network.
In the Setting a Master-Slave Hierarchy subsection 'Enabling Datalinks To Write Data', revised step 3 for better clarity.
In the Using RSLogix 5000 Drive Add-On Profiles (version 16 or later) subsection 'Adding the Drive/Adapter to the I/O Configuration', added a TIP at the end of step 1.
Added the new section 'Using Automatic Device Configuration (ADC) with RSLogix 5000 version 20 (or later)'.
In the Using RSLogix 5000 Generic Profile subsection 'Adding the Drive/Adapter to the I/O Configuration', corrected Input Size and Output Size information in step 4.
In the 'Using Reference/Feedback' section, re-organized and added new information.
In Chapter 6 Explicit Messaging, added Table 8 and footnotes to message configuration screens throughout the chapter about limitations when using DPI Parameter Object Class code 0x93 or Host DPI Parameter Object Class code 0x9F.
In the 'Viewing and Clearing Events' section, added more information.
In the Communications specifications subsection 'Connection Limits', added more information.
Added new Appendix E 'History of Changes'.

750COM-UM001A-EN-P, January 2009

Change
This was the first release of this manual.

The following terms and abbreviations are used throughout this manual. For definitions of terms not listed here, see the Allen-Bradley Industrial Automation Glossary, publication AG-7.1.

Adapter Devices such as drives, controllers, and computers usually require a network communication adapter to provide a communication interface between them and a network such as EtherNet/IP. An adapter reads data on the network and transmits it to the connected device. It also reads data in the device and transmits it to the network.

The embedded EtherNet/IP adapter connects its PowerFlex 755 drive to an EtherNet/IP network. Adapters are sometimes also called 'cards', 'embedded communication options', 'gateways', 'modules', or 'peripherals'.

ADC (Automatic Device Configuration) An RSLogix 5000 software, version 20.00 or later, feature that supports the automatic download of configuration data upon the Logix controller establishing an EtherNet/IP network connection to a PowerFlex 750-Series drive (firmware version 4.001 or later) and its associated peripherals.

BOOTP (Bootstrap Protocol) BOOTP lets the adapter configure itself dynamically at restart if the network has a BOOTP server. The BOOTP server assigns the adapter a preconfigured IP address, a subnet mask, and a gateway address; therefore, you do not have to configure these with the parameters in the adapter. BOOTP can make it easier to administer an Ethernet network. A **free version** of the Rockwell Software® BOOTP/DHCP server can be obtained at http://www.software.rockwell.com/support/download/detail.cfm?ID=3390.

Bridge A network device that can route messages from one network to another. A bridge also refers to a communications module in a ControlLogix controller that connects the controller to a network. See also Scanner.

CIP (Common Industrial Protocol) CIP is the transport and application layer protocol used for messaging over EtherNet/IP, ControlNet, and DeviceNet networks. The protocol is used for implicit messaging (real-time I/O) and explicit messaging (configuration, data collection, and diagnostics).

Connected Components Workbench Software The recommended tool for monitoring and configuring Allen-Bradley products and network communication adapters. It can be used on computers running various Microsoft Windows operating systems. You can obtain a **free copy** of Connected Components Workbench software at http://www.ab.com/support/abdrives/webupdate/software.html.

ControlFLASH A **free** software tool used to electronically update the firmware of Allen-Bradley products and network communication adapters. ControlFLASH software is downloaded automatically when the firmware revision file for the product being updated is downloaded from the Allen-Bradley updates website to your computer.

Controller A controller, also called programmable logic controller, is a solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory. See also Scanner.

Data Rate The speed at which data is transferred on the EtherNet/IP network. You can set the adapter to a data rate of 10Mbps Full-Duplex, 10Mbps Half-Duplex, 100Mbps Full-Duplex, or 100Mbps Half-Duplex. If another device on the network sets or auto-negotiates the data rate, you can set the adapter to automatically detect the data rate.

Datalinks A Datalink is a type of pointer used by PowerFlex 750-Series drives to transfer data to and from the controller. Datalinks allow specified parameter values to be accessed or changed without using explicit messages. When enabled, each 32-bit Datalink in a PowerFlex 750-Series drive consumes 4 bytes in the input image table and/or 4 bytes in the output image table of the controller.

DriveExplorer Software A tool for monitoring and configuring Allen-Bradley products and network communication adapters. It can be used on computers running various Microsoft Windows operating systems. DriveExplorer software, version 6.xx or later, can be used to configure this adapter and connected drive. This software tool has been discontinued and is now available as **freeware** at http://www.ab.com/support/abdrives/webupdate/software.html. There are no plans to provide future updates to this tool and the download is being provided 'as-is' for users that lost their DriveExplorer CD, or need to configure legacy products not supported by Connected Components Workbench software.

DriveTools SP Software A software suite designed for running on various Microsoft Windows operating systems. This software suite provides a family of tools, including DriveExecutive software (version 3.01 or later), that you can use to program, monitor, control, troubleshoot, and maintain Allen-Bradley products. DriveTools SP software, version 1.01 or later, can be used with PowerFlex 750-Series, PowerFlex 7-Class, and PowerFlex 4-Class drives, and also legacy drives that implement a SCANport communication interface. Information about DriveTools SP software can be obtained at http://www.ab.com/drives/drivetools.

Duplex Duplex describes the mode of communication. 'Full-duplex' communications let a device exchange data in both directions at the same time. 'Half-duplex' communications let a device exchange data only in one direction at a time. The duplex used by the adapter depends on the type of duplex that other network devices, such as switches, support.

EDS (Electronic Data Sheet) Files Simple text files that are used by network configuration tools to describe products so that you can easily commission them on a network. EDS files describe a product device type and revision. EDS files for many Allen-Bradley products can be found at http://www.ab.com/networks/eds.

EtherNet/IP Network EtherNet/IP (Industrial Protocol) is an open producer-consumer communication network based on the Ethernet standard (IEEE 802.3), TCP/IP, UDP/IP, and CIP. Designed for industrial communications, both I/O and explicit messages can be transmitted over the network. Each device is assigned a unique IP address and transmits data on the network. The number of devices that an EtherNet/IP network can support depends on the class of IP address. For example, a network with a Class C IP address can have 254 nodes.

General information about EtherNet/IP and the EtherNet/IP specification are maintained by the Open DeviceNet Vendor's Association (ODVA). ODVA is online at http://www.odva.org.

Explicit Messaging Explicit messages are used to transfer data that does not require continuous updates. They are typically used to configure, monitor, and diagnose devices over the network.

Fault Action A fault action determines how the adapter and connected drive act when a communication fault (for example, a disconnected cable) occurs or when the controller is switched out of run mode. The former uses a communication fault action, and the latter uses an idle fault action.

Fault Configuration When communication is disrupted (for example, a cable is disconnected), the adapter and its PowerFlex 750-Series drive can respond with a user-defined fault configuration. The user sets the data that is sent to the drive using specific fault configuration parameters in the adapter. When a fault action parameter is set to use the fault configuration data and a fault occurs, the data from these parameters is sent as the Logic Command, Reference, and/or Datalinks.

Gateway A device on a network that connects an individual network to a system of networks. When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks. You need to configure the address for the gateway device in the adapter if you want the adapter to communicate with devices that are not on its network.

Hardware Address Each Ethernet device has a unique hardware address (sometimes called a MAC address) that is 48 bits. The address appears as six digits separated by colons (for example, xx:xx:xx:xx:xx:xx). Each digit has a value between 0 and 255 (0x00 and 0xFF). This address is assigned in the hardware and cannot be changed. It is required to identify the device if you are using a BOOTP or DHCP server.

HIM (Human Interface Module) A device that can be used to configure and control a drive. The PowerFlex 20-HIM-A6 or 20-HIM-C6S HIM can be used to configure PowerFlex 750-Series drives and their connected peripherals.

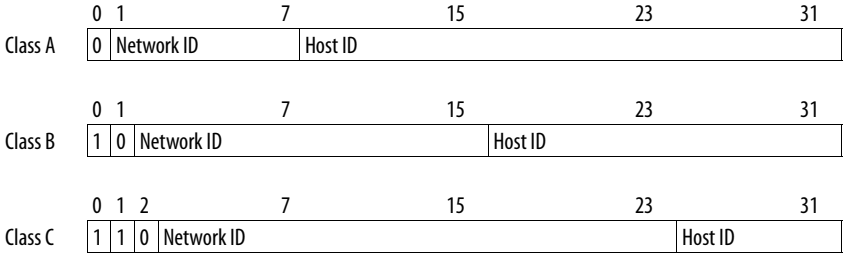
Hold Last When communication is disrupted (for example, a cable is disconnected), the adapter and its PowerFlex drive can respond by holding last. Hold last results in the drive receiving the last data received via the network connection before the disruption. If the drive was running and using the Reference from the adapter, it will continue to run at the same Reference.

Idle Action An idle action determines how the adapter and connected drive act when the controller is switched out of run mode.

I/O Data I/O data, sometimes called 'implicit messages' or 'input/output', is time-critical data such as a Logic Command and Reference. The terms 'input' (To Net) and 'output' (From Net) are defined from the controller's point of view. Output is produced by the controller and consumed by the adapter. Input is produced by the adapter and consumed by the controller.

IP Addresses A unique IP address identifies each node on an EtherNet/IP network. An IP address consists of 32 bits that are divided into four segments of one byte each. It appears as four decimal integers separated by periods (xxx.xxx.xxx.xxx). Each 'xxx' can have a decimal value from 0 to 255. For example, an IP address could be 192.168.0.1.

An IP address has two parts: a network ID and a host ID. The class of network determines the format of the address.



The number of devices on your EtherNet/IP network will vary depending on the number of bytes that are used for the network address. In many cases you are given a network with a Class C address, in which the first three bytes contain the network address (subnet mask = 255.255.255.0). This leaves 8 bits or 256 addresses on your network. Because two addresses are reserved for special uses (0 is an address for the network usually used by the router, and 255 is an address for broadcast messages to all network devices), you have 254 addresses to use on a Class C address block.

To be sure that each device on the Internet has a unique address, contact your network administrator or Internet Service Provider for unique fixed IP addresses. You can then set the unique IP address for the adapter by using its rotary address switches, a DHCP or BOOTP server, or by manually configuring parameters in the adapter. The adapter reads the values of these parameters only at power-up.

Logic Command/Logic Status The Logic Command is used to control the PowerFlex 750-Series drive (for example, start, stop, and direction). It consists of one 32-bit word of output to the adapter from the network. The definitions of the bits in this word are shown in Appendix D.

The Logic Status is used to monitor the PowerFlex 750-Series drive (for example, operating state and motor direction). It consists of one 32-bit word of input from the adapter to the network. The definitions of the bits in this word are shown in Appendix D.

Master-Slave Hierarchy An adapter configured for a master-slave hierarchy exchanges data with the master device. Usually, a network has one scanner which is the master device, and all other devices (for example, drives connected to EtherNet/IP adapters) are slave devices.

On a network with multiple scanners (called a multi-master hierarchy), each slave device must have a scanner specified as a master.

NVS (Nonvolatile Storage) NVS is the permanent memory of a device. Devices such as the adapter and drive store parameters and other information in NVS so that they are not lost when the device loses power. NVS is sometimes called 'EEPROM'.

PCCC (Programmable Controller Communications Command) PCCC is the protocol used by some controllers to communicate with devices on a network. Some software products (for example, DriveExplorer software and DriveExecutive software) also use PCCC to communicate.

Peer-to-Peer Hierarchy An adapter that is configured for a peer-to-peer hierarchy can exchange data with a device on the network that is not a scanner. This type of hierarchy can be set up so that a scanner configures or transmits data to one PowerFlex 750-Series drive which then sends the same configuration or data to other PowerFlex 750-Series drives on the network. To use a peer-to-peer hierarchy, you configure one adapter to transmit data and one or more adapters to receive the data.

Ping A message that is sent on the network to determine if a node exists.

PowerFlex 755 (Architecture Class) Drives The Allen-Bradley PowerFlex 755 drives are part of the PowerFlex 750-Series of drives.

Reference/Feedback The Reference is used to send a setpoint (for example, speed, frequency, and torque) to the drive. It consists of one 32-bit word of output to the adapter from the network.

Feedback is used to monitor the speed of the drive. It consists of one 32-bit word of input from the adapter to the network.

RSLogix 5000 Software RSLogix software is a tool for configuring and monitoring controllers to communicate with connected devices. It is a 32-bit application that runs on various Windows operating systems. Information about RSLogix software can be found at http://www.software.rockwell.com/rslogix. See also Studio 5000 environment.

Scanner A scanner is a separate module (of a multi-module controller) or a built-in component (of a single-module controller) that provides communication with adapters connected to a network. See also Controller.

Status Indicators LEDs that are used to report the status of the adapter, network, and drive. The status indicators for the adapter can be viewed on the front cover of the drive when the drive is powered.

Stop Action When communication is disrupted (for example, a cable is disconnected), the adapter and drive can respond with a stop action. A stop action results in the drive receiving zero as values for Logic Command, Reference, and Datalink data. If the drive was running and using the Reference from the adapter, it will stay running but at zero Reference.

Studio 5000 Environment The Studio 5000 Engineering and Design Environment combines engineering and design elements into a common environment. The first element in the Studio 5000 environment is the Logix Designer application. The Logix Designer application is the rebranding of RSLogix 5000 software and will continue to be the product to program Logix 5000 controllers for discrete, process, batch, motion, safety, and drive-based solutions.

The Studio 5000 environment is the foundation for the future of Rockwell Automation engineering design tools and capabilities. It is the one place for design engineers to develop all the elements of their control system.

Subnet Mask An extension to the IP addressing scheme that lets you use a single network ID for multiple physical networks. A bit mask identifies the part of the address that specifies the network and the part of the address that specifies the unique node on the network. A '1' in the subnet mask indicates the bit is used to specify the network. A '0' in the subnet mask indicates that the bit is used to specify the node.

For example, a subnet mask on a network may appear as follows: 11111111 11111111 11111111 11000000 (255.255.255.192). This mask indicates that 26 bits are used to identify the network and 6 bits are used to identify devices on each network. Instead of a single physical Class C network with 254 devices, this subnet mask divides it into four networks with up to 62 devices each.

Switches Network devices that provide virtual connections that help to control collisions and reduce traffic on the network. They are able to reduce network congestion by transmitting packets to an individual port only if they are destined for the connected device. In a control application, in which real time data access is critical, network switches may be required in place of hubs.

TCP (Transmission Control Protocol) EtherNet/IP uses this protocol to transfer Explicit Messaging packets using IP. TCP guarantees delivery of data through the use of retries.

UDP (User Datagram Protocol) EtherNet/IP uses this protocol to transfer I/O packets using IP. UDP provides a simple, but fast capability to send I/O messaging packets between devices. This protocol ensures that adapters transmit the most recent data because it does not use acknowledgements or retries.

UDDT (User-Defined Data Type) A structure data type that you define during the development of an application (for example, to convert 32-bit REAL parameter data for written and read values to correctly display them in human readable format).

Update The process of updating firmware in a device. The adapter can be updated using various Allen-Bradley software tools. See Updating the Adapter Firmware on page 43 for more information.

Zero Data When communication is disrupted (for example, a cable is disconnected), the adapter and drive can respond with zero data. Zero data results in the drive receiving zero as values for Logic Command, Reference, and Datalink data. If the drive was running and using the Reference from the adapter, it will stay running but at zero Reference.

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